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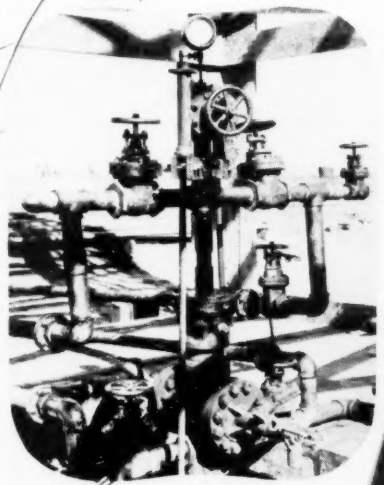

1922

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1946

Cover illustration of the new Cameron Catalog showing a Cameron 15,000 Pound Test Christmas Tree installation.

CAMERON IRON WORKS, INC., HOUSTON, TEXAS

CAMERON SAFETY CHRISTMAS TREES

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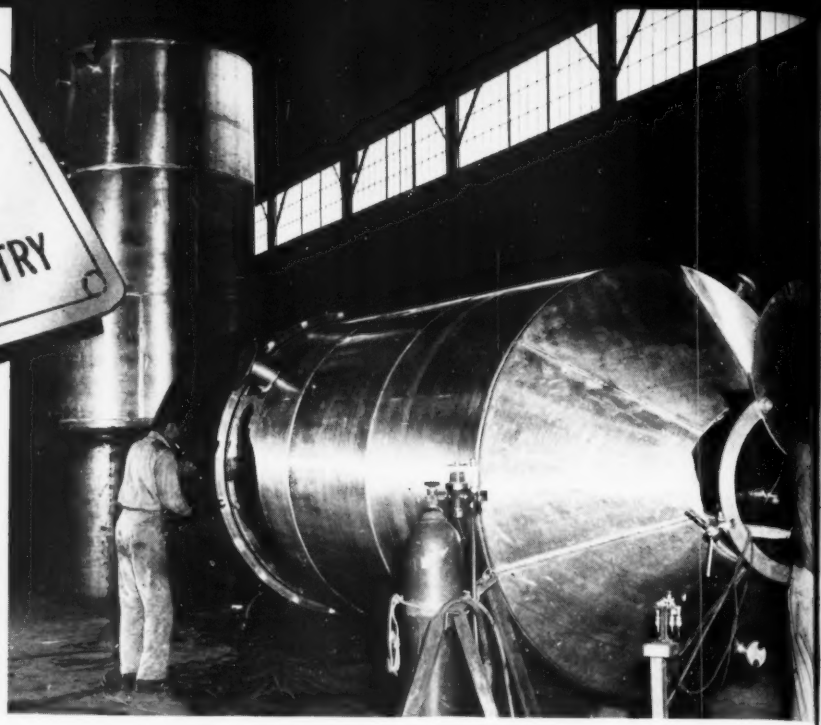
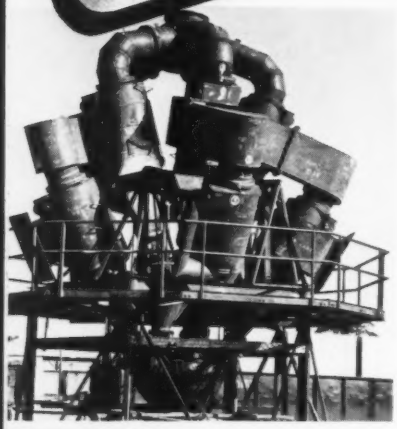
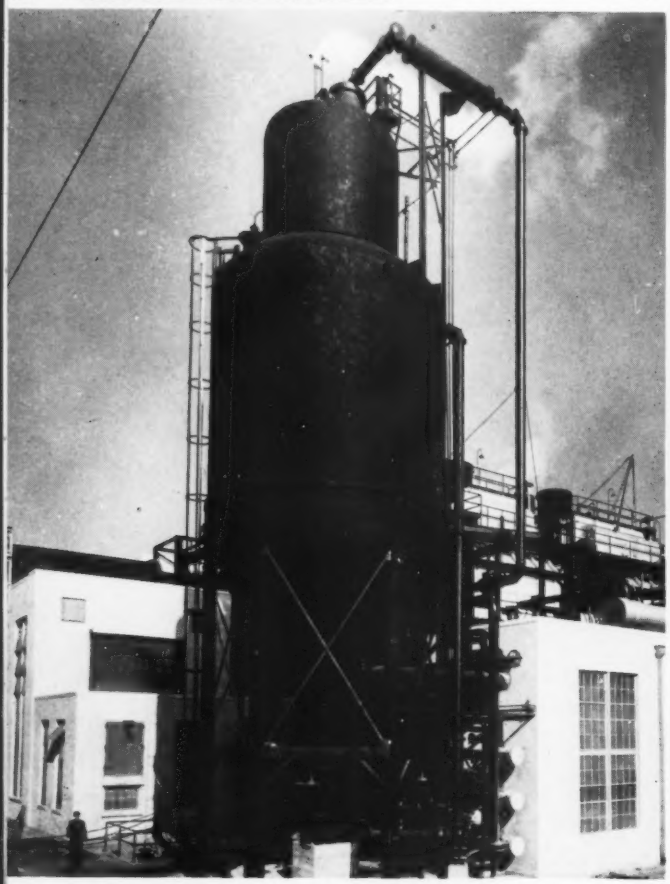
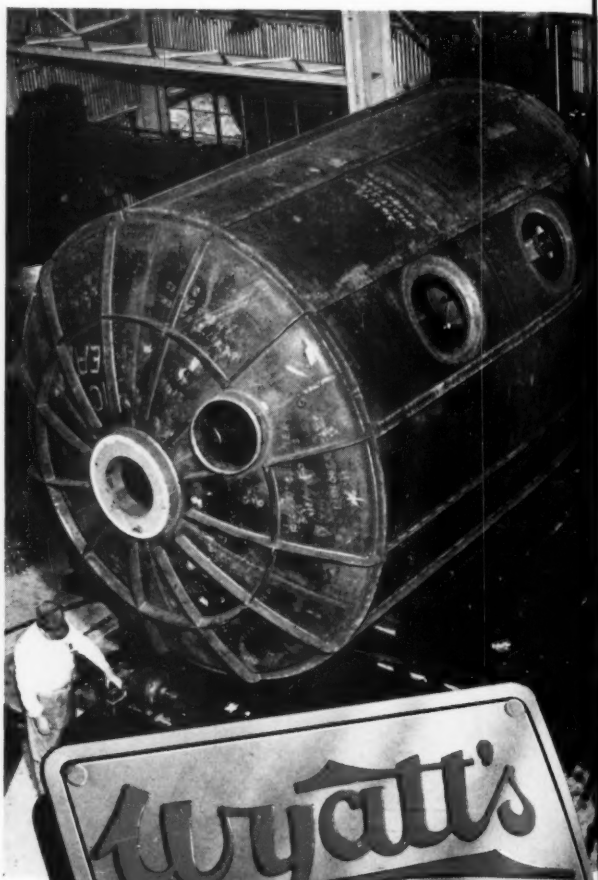




Above: Aluminum tanks. Left: Buell van Tongeren catalyst collector. Lower left: Water softening equipment. Lower right: Rotating drum for rice processing.





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211 S. CHEYENNE AVE., TULSA 1, OKLAHOMA

FOUNDED IN 1910 BY PATRICK C. BOYLE

Subscription rate to the petroleum industry, United States and foreign, 1 year, $3.00. Single copies, 20 cents. Back copies, when over a year old, 50 cents. Note: Payments from outside the U.S.A. may be in the form of an international money order or check on a U.S.A. bank. Entered as second-class mail matter at Tulsa, Okla., under Act of March 3, 1879.

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Vol. 45, No. 32 December 14, 1946

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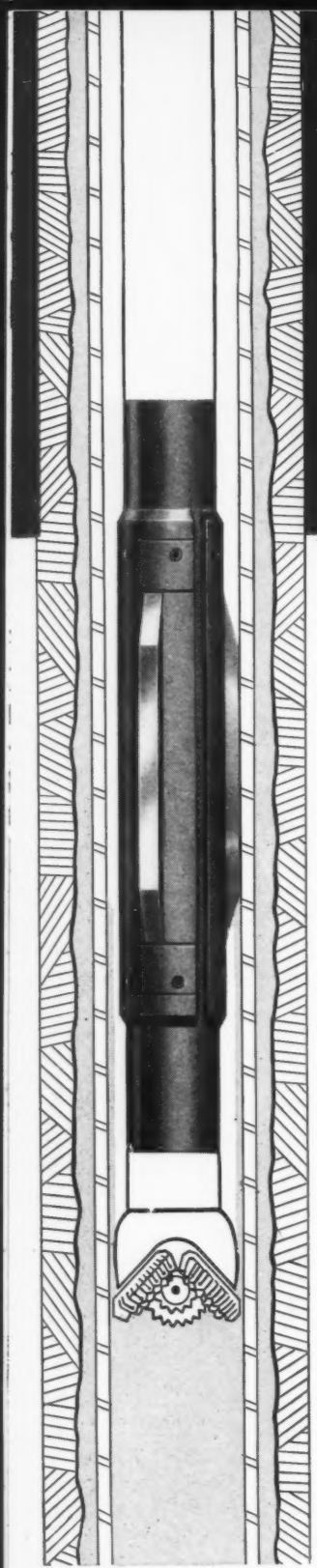

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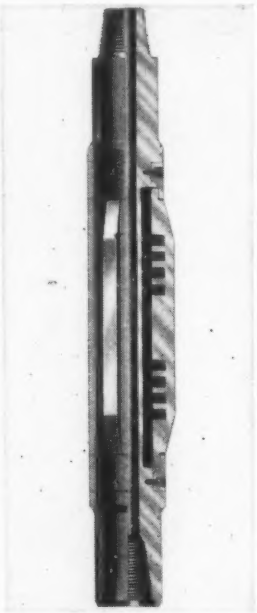

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No Longer Byproducts

ANOTHER coal strike has brought home the fact that petroleum and natural gas are the only substantial safeguards this country has in a national fuel crisis brought about by the arbitrary action of a labor leadership which places its immediate ends above public interests—a policy to which long-suffering consumers gave indication of tiring in this instance.

It has been demonstrated over the past month that important areas of this country can maintain a normal economic balance for a prolonged period without using a ton of coal. Transportation, industry, public utilities, and heating can be maintained in these areas with gas and oil.

Throughout the entire country it was apparent that the normal and emergency uses of liquid and gaseous hydrocarbons were important factors in relieving conditions brought about by the coal shortage. These developments unquestionably were factors in the decision to end the strike.

Inquiries received by oil and gas companies in recent weeks point to steadily expanding outlets for their products as fuel. These markets include liquefied gases, burning oils, furnace oils, and diesel oils as well as residual fuel oil and pipe-line gas. Coal strikes and the uncertainty regarding the future have given impetus to petroleum-consumption trends.

The question now being raised by students of the petroleum industry has to do with the price basis on which these fuel markets should be supplied. These oils for years were marketed as byproducts. They were usually the cuts left after the maximum yields of gasoline and kerosene were obtained in refinery processing. The prices received in refinery and wholesale markets reflected the secondary position of the commodity. Gasoline was and is the "money" product.

Now these fuel oils and burning oils are "tailor made" to meet the requirements of old and new markets. Much greater efficiency in utilization and better service have resulted from improved quality. The various grades of furnace oils and other fuels now stand on their own feet in well-established and expanding markets.

Starting at the refinery there is no reason why these heavier fractions of a barrel of crude oil should not have a stronger and more equitable price position than they have had in the past. Increased costs and changes in the competitive situation of other fuels have not been adequately reflected in refinery and retail quotations.

Petroleum fuels can and should carry a larger percentage of the overall costs of the petroleum industry. The position of natural gas is similar. The action of the Oklahoma Corporation Commission this week in establishing a minimum price for Hugoton gas is a step reflecting the actual value of the gas at the well head. Both the petroleum and natural-gas industries are now strongly entrenched in the most desirable fuel markets and returns to operators should reflect that fact.

WAA to Seek New Policy Governing Big-Inch Disposal

by Henry D. Ralph

WASHINGTON.—The big-inch pipe lines will be readvertised for permanent sale permitting their use for transmission of natural gas, the House surplus-property investigating committee was told last week by War Assets Administrator Robert M. Littlejohn.

Within 2 weeks Littlejohn said he hopes to issue a new disposal-policy report replacing that sent to Congress last January by Surplus Property Administrator Stuart Symington, and on the basis of the new report he will at once advertise for new bids. The report will not come before Congress officially until the new session opens January 3, and the administrator said if Congress does not interpose objections within 30 days he should be ready to make an award by February 3.

Correcting his earlier testimony, Littlejohn said the new bids will not be informal and will not be limited to previous bidders, neither will WAA set a minimum price. The new advertisement will be a brief announcement and prospective bidders will be given a detailed set of conditions and specifications and a bid form leaving only a few blanks to be filled in. In this way, he explained all bids will be comparable, and the award will be made to the highest responsible cash bidder. A deposit of "earnest money" will be required with each bid. Littlejohn told the committee he does not consider debentures or other securities as a satisfactory method of payment, but did not rule out the possibility that some of the cash payment may be deferred for a time after date of the award.

The new policy report probably will call for sale for either oil or gas use in the present or future option of the purchaser. Littlejohn said it would be unwise to designate permanent use because economic conditions in the oil and gas industries might change over a period of years.

The administrator drew a distinction between the positions taken in a letter to him from Secretary of the Interior Krug and testimony before the committee by R. K. Davies of the Oil and Gas Division. While both said there was no economic need for the lines in oil transmission and their use for gas would facilitate conservation, particularly if sale is conditioned on use of flare gas, Littlejohn said Davies insisted on exclusive and permanent gas use. This, he told the committee, would restrict the bid conditions, perpetuate the controversy, and preclude early disposal.

Further information on the emergency conversion of the big-inch pipe lines will be found as a part of the Pipe-Line News section, pages 122-124.

However, he intimated that the bid conditions might require transportation of a minimum amount of gas now being wasted.

Although the administrator has now abandoned the Symington report, the committee spent several days attempting to interpret its meaning. Littlejohn stuck to his contention that its wording prohibited him from selling the lines for gas use. Most other witnesses thought sale for gas was permitted and that oil use was only given preference and not made mandatory.

Symington himself, now assistant secretary of war, said he intended to leave the way open for gas use if an oil sale were not practical, that he would have sold for gas had he remained administrator, and that he so advised Littlejohn.

Gas Flow Begins in Big-Inch System; Lease Unaffected by End of Strike

WASHINGTON. — Natural gas was started through the big-inch pipeline system the afternoon of December 5—3 days after the Government approved a temporary lease to Tennessee Gas & Transmission Co. to relieve the fuel shortage in the Appalachian area.

Sudden settlement of the coal strike Saturday apparently left unaffected the 4 months' emergency lease given T. G. & T. The company needs the gas for winter delivery, even with normal coal production. Gardiner Symonds, T. G. & T. president, said "the gas utilities in the Appalachian area which we serve have been hard pressed to meet the demands of their customers for many months, and Tennessee Gas & Transmission Co. has been seeking ways to alleviate this shortage."

The interim lease was decided upon by Secretary of the Interior J. A. Krug the morning of December 2, and by nightfall War Assets Administration had given T. G. & T. a letter of intent to write a detailed contract, and the Federal Power Commission had issued a temporary certificate for transmission of the gas.

The decision followed 4 days of intensive conferences by an interdepartmental committee headed by Interior's Oil and Gas Division. In addition to T. G. & T.'s proposal, applications for emergency gas use had been made by three firms bidding for permanent acquisition of the big-inch lines—Big Inch, Inc., Big Inch Natural Gas Transmission Co., and Transcontinental Gas Pipe Line Co.

Reasons for selecting T. G. & T. were examined closely by the House surplus - property committee, which called as witnesses Ralph K. Davies, acting director of the Oil and Gas Division, and Max W. Ball, consulting engineer called in to assist OGD. The committee evidently thought Big Inch Oil, Inc., had submitted a better proposal because it promised to deliver more gas and offered rental of 8 cents per 1,000 cu. ft. compared with 6 cents offered by T. G. & T.

In essence Davies and Ball told the committee that with the exception of Bear Creek field which was available only to Big Inch Oil, all four applications were planning to use the same gas, all could obtain sufficient gas to fill the line to its maximum capacity without compression, all proposed to take over the maintenance contract and services of Williams Brothers, and each would accept any rental and other contract terms asked by the Government.

The question quickly narrowed down to which concern could get into action fastest, they testified, and T. G. & T. was chosen because it is a going concern with an organization of engineers already on the spot, it had 50,000,000 cu. ft. of its own gas available for immediate introduction into the big-inch system, its gas is already dehydrated, it is equipped to clean the gas at delivery points, and it proposes to strengthen the line at certain river crossings. They said T. G. & T. was very conservative in its promises while B. I. O. was optimistic, but that the ultimate maximum capacity would be reached by either. It was also explained that T. G. & T. proposed to pay a rental of 6 cents per 1,000 cu. ft. and sell the gas for 23 cents while B. I. O. proposed 8 cents rental with a sales price of 25 cents, but FPC preferred the former schedule.

Optimism Over Industry's Future Marks Compact Meeting

by George Weber

CONVERSION of the nation's oil and gas resources, the industry's 1946 record, and the outlook for 1947 took major attention at the winter quarterly meeting of the Interstate Oil Compact Commission in Dallas December 9-11. A general feeling of optimism concerning the coming year was tempered by a realization of the growing need for conservation and the immediate demand for improving and expanding secondary-recovery operations as a principal instrument of conservation.

A wide range of problems and studies, all dealing in some way with the problem of conserving oil and increasing recoverable reserves, was covered in the meetings of 10 committees on the morning of the opening day.

The first general session on the morning of December 10 was opened by an address of welcome by Texas Gov. Coke R. Stevenson. Response to the welcome was presented by New Mexico's Gov. John J. Dempsey. Presiding as commission chairman was Robert S. Kerr, governor of Oklahoma. Gov. A. F. Schoeppel of Kansas and former Gov. Sam H. Jones of Louisiana attended the 3-day session and Gov.-elect Beauford Jester of Texas was present during part of the meeting.

The subject of state regulation of natural-gas production was discussed in a paper, "Effective System of Statewide Gas Proration and Ratable Take," by Jack Baumel, chief engineer, Oil and Gas Division, Texas Railroad Commission. An abridgement of his paper is found on the following page. The same subject was previously discussed during the first day of the meeting by Ernest O. Thompson, Texas Railroad Commission member. Speaking at the round-table session, Thompson made an optimistic forecast for the industry in 1947. "With a balanced supply and demand under sound conservation laws the oil industry goes into 1947 with the best outlook in its history," he said, citing the prospects of unprecedented demand for natural gas and all types of petroleum products.

The recent sharp increase in stocks, however, led him to state his opinion that an immediate production cut on the order of 30,000 bbl. daily was needed and further reductions in withdrawals should be made if stocks continue to rise at greater than the normal rate. Thompson's report on gas conservation stated that 75 per cent of all flare gas from oil wells had already been closed in and that there is no gas waste in the state from gas wells. The rise in gas prices has, in his opinion, reversed the situation which in the past would have made the mandatory reinjection of all gas from all oil wells, confiscatory in nature. "Now with a better market," he continued, "flare gas has increased in price to a present value of 5 cents per thousand. Therefore, it is worth saving, and in my opinion we can now legally compel its full conservation and utilization, except as noted in isolated cases of small amounts of flare gas." As regards unitization, he added, "unit operation of oil and gas fields is coming into its own. It will save money for the public."

Committee Reports

Committee reports presented at the second general session were highlighted by those of the research and coordinating committee and the economics-advisory committee. Following the request of the commission at the summer meeting in Grand Rapids, members of the research and coordinating committee completed an extensive study of secondary-recovery operations. In detail, the report included surveys of the work being done by each state and by government agencies to stimulate more interest in secondary-recovery research. Summarizing the committee found it highly important that the states be awakened to their responsibilities in obtaining the greatest ultimate recovery from stripper wells. It cited the Compact Commission's ideal position to play a coordinating role in research and development in this work.

It was tentatively recommended that each oil-producing state make a survey of the best possible means of establishing secondary-recovery research facilities, and that each state delegate one fulltime technical employe to the study of secondary-recovery operations. Coordination of such work at group meetings in each state and joint meetings of all state and association representatives was further recommended.

Other committees reported on a number of phases of conservation work. In preparation for submitting its recommendations to the commission, the Economics Advisory Committee had devoted 3 days of work immediately prior to the meeting. The committee reported in full on its study of additions to stocks during the past year, adding its interpretations of their significance. Considering all aspects of the statistical position of the industry to the present, the committee forecast demand for petroleum and its products in 1947.

Proper Reservoir Control

A strong argument for state legislation which will stimulate field-wide unitization at the same time safeguarding individual rights, was sounded in the paper, "Proper Control of Oil Reservoirs," by Don R. Knowlton, Knowlton Engineering Co., Oklahoma City. Citing reservoir control as the most important fundamental concept of conservation, he stressed the need for its early application in newly developed pools, thus avoiding irreparable waste and obviating costly secondary-recovery methods. "Use of the knowledge of reservoir control usually requires unitization so that most effective efforts can be made," he stated. He urged that wholehearted efforts of the industry should be devoted to gaining passage of legislation promoting unitization in every oil-producing state.

Since conservation through secondary-recovery practices concerns stripper properties primarily, the 1945 survey of stripper wells received considerable attention. In presenting the report, prepared jointly by the commission and the National Stripper Well Association, E. G. Dahlgren, assistant secretary of the commission, revealed that 71 per cent of the nation's oil producers are stripper wells which averaged 2.1 bbl. daily or 13.5 per cent of domestic production during 1945. Stripper well acreage comprises 46 per cent of all producing acreage in this country. The survey showed a total of 421,447 producing oil wells in the nation as of January 1, 1946, of which 299,146 were classified as strippers. A total of 9,013 producing wells were abandoned in 1945, leaving an estimated total of 18,626,927 bbl. of recoverable oil in the ground. This compared with an estimated 34,000,000 bbl. abandoned in 1944 and 44,000,000 bbl. in 1942. It was estimated in the report that were the price of crude oil increased 75 cents per barrel, a total in excess of 1,825,000,000 bbl. of additional reserves would be recovered from stripper wells by secondary-recovery methods. A 50-cent price increase would add over 1,255,000,000 bbl. and a 25-cent increase, over 335,000,000 bbl.

At a business meeting the commission directed the headquarters office to undertake the survey of oil stocks recommended at the summer meeting. The holding of three general meetings was approved for 1947.

Texas Gas Proration Operates Under Specific Statute and Rules

by Jack K. Baumel

STATE-WIDE gas proration is an ideal system to strive for, and as our reserves increase, that is the only method that can be used to prevent selective buying. Under such a system each field can be allocated an allowable, based on an efficient withdrawal, that will prevent premature encroachment and coning of water; and the amount allocated to each pool or field should then be allocated, based upon a formula containing factors given in the beginning of this paper, in order that each producer may have a fair share in the field's production.

The history of gas proration in Texas is in the main a story of recent events and a battle in the courts.

The Railroad Commission of Texas has recognized that gas must be prorated in fields in order to have ratable taking. Prior to the Corzelius case the Railroad Commission of Texas prorated gas only in cases where physical waste occurred. However, the decision of the Corzelius case gave the commission power to prorate gas not only to prevent physical waste but to protect correlative rights.

The specific statute under which the commission operates states that it was enacted for the protection of public and private interests against the evils of the production and use of natural gas under wasteful conditions by prohibiting such waste and by compelling ratable production.

Article 6008, Section 10, of the statutes reads as follows:

"It shall be the duty of the commission to prorate and regulate the daily gas-well production from each common reservoir in the manner and method herein set forth. The commission shall prorate and regulate such production for the protection of public and private interests:

"(a) In the prevention of waste as waste is defined herein;

"(b) In the adjustment of correlative rights and opportunities of each owner of gas in a common reservoir to produce and use or sell such gas as permitted in this article."

At the same time, to distribute the allowable ratably among wells in the field, based on the allocation formula adopted for that field after due notice and hearing, the commission distributes the allowable, based upon such formula, to all wells in the field whether they have connections or not. This is done according to Article 6008, Section 20, which reads as follows:

One of the significant papers at the Interstate Oil Compact Commission meeting was that given by Jack K. Baumel, chief engineer of the Railroad Commission of Texas and member of the commission's research and coordinating committee. The accompanying material is part of the paper, "The Feasibility and Possibility of a State-Wide Plan of Gas Proration and Ratable Take," and specifically outlines the gas proration situation in Texas and the procedures which have developed there.

"In the event the commission finds that the owner of any gas well has failed or refused to utilize or sell the allowable production from his well, when such owner has been offered a connection or market for such gas at a reasonable price, such well shall be excluded from consideration in allocating the daily allowable production from the reservoir or zone in which same is located until the owner thereof signifies to the commission his desire to utilize or sell such gas. In all other cases all gas wells shall be taken into account in allocating the allowable production among wells producing the same type of gas."

Gas Regulations in Texas

Operating under the statutes previously referred to, the commission has done these things with respect to the regulating of production of gas in Texas:

1. It has promulgated a general rule of statewide application which rule applies in the absence of a specific rule. This general rule limits the daily take from gas wells to a quantity not to exceed 25 per cent of its open-flow potential capacity.

2. With respect to the production of casing-head gas, it has also promulgated a state-wide rule which applies in the absence of a specific field rule, which state-wide rule sets up a permissible gas-oil ratio of 2,000 cu. ft. per barrel. If the production of such quantity of gas per barrel of oil is deemed to result in an inefficient use of gas, then, after notice and hearing, it may prescribe a permissible gas-oil ratio which testimony shows will result in the efficient utilization of gas to produce the oil. In some fields this permitted ratio is as low as 500 cu. ft. per barrel; whereas, in other fields it may exceed 2,000 cu. ft. per barrel.

3. Another way that the commission has sought to obtain the greatest utilization of the gas contained in a reservoir that is productive of both gas and oil is to allow the closing in of the wells that produce with ratios in excess of that prescribed by the commission and to permit the transferring to and production from wells of the allowable of such closed in wells, provided the transferred oil must be produced from wells that operate with gas-oil ratios lower than the operating ratio of the wells from which the oil is transferred.

4. The commission has always advocated and encouraged the picking up of casing-head gas from oil wells and the returning of it to the producing formation where such is necessary for reservoir-pressure maintenance.

Gas Proration in Specific Fields

With respect to reservoirs that are productive of gas only, most of these reservoirs in Texas, so far as potential capacity is concerned, lie along the Gulf Coast, and in the Panhandle district. For several years the commission has been prorating natural gas in the Panhandle field, one of the largest reserves in the nation. Gas-proration schedules are prepared monthly for allocating among the various wells their proportionate part of the gas outlet assigned the field. Other fields in which gas is being prorated in Texas are the Alief, Blue Lake, La Blanca, Carthage, Navarro Crossing, Oakwood, Rodessa, Whelan, Sipe Springs, Eden, South Weslaco, McAllen, and the North Louise fields.

The reasonable, lawful, required production from any of the above fields is determined from nominations for the production from gas wells producing from each separate reservoir or zone, which are submitted to the commission in affidavit form by purchasers of gas from the fields in question. After investigation, the field is then distributed upon the allocation formula, on a basis of two-thirds rock pressure times acreage plus one-third potential or one-half acreage times rock pressure plus one-half potential, with the proration units ranging from 160 acres in some fields to 640 acres in other fields.

The Carthage field is prorated on 100 per cent acreage times reservoir pressure and allowing 640-acre proration units. Another conservation measure is the placing of a volumetric displacement on gas wells. Such a rule is designed to permit any gas well to void as much space in the reservoir daily as does an oil well producing from the same reservoir. This rule has been instituted in a number of Texas fields.

THIS 1946 WEEK

S M T W T F S

EXPLORATION—Pacific Western Oil's wildcat in Kern County, California, delayed by fishing job at world-record depth of 16,668 ft. . . . ¶Oklahoma discovery gives added significance to deep producing trend in Garvin and McClain counties. . . . ¶Continental wildcat in Barber County completed as most productive Kansas discovery well of the year. . . . Flow estimated at 50 bbl. per hour of 27° gravity oil. . . . ¶Carter Oil Co. strike may be first major discovery in Michigan in 2 years. . . . Oceana County wildcat flows 10 bbl. hourly, through chokes, from Traverse lime. . . .

THE BIG-INCH— WAA Head Littlejohn tells House committee Congress will be asked to approve new big-inch disposal policy permitting use of government-owned lines for gas. . . . Observers foresee another fight by coal and railroad interests, but interested government agencies, including the military, now seem to have no objection to use for gas movement. . . . ¶Despite end of the coal strike, Tennessee Gas & Transmission pushes work to increase gas flow through the lines to meet winter fuel shortages. . . . Throughput of 150,000,000 cu. ft. daily expected to be attained by end of next week. . . . T. G. & T. making deliveries under interim lease to East Ohio Gas and Ohio Fuel Gas according to FPC allocations. . . .

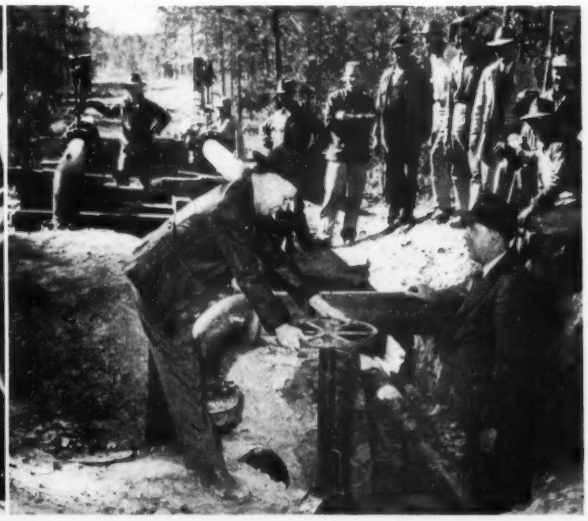
PRICES— Pennsylvania purchasing companies post 14-cent increase for Penn-grade crude. . . . ¶Washington announcement due this week reducing stripper-well payments. . . . Action expected to eliminate subsidy entirely except for Penn-grade area since the general average of crude prices is now 35 cents above prices prevailing last June 30. . . . ¶Heating oil prices continue to rise, reflecting increasing winter consumption and last month's crude advance. . . . ¶Heavy fuel-oil demand eases with end of coal strike, checking some speculative buying. . . . ¶Distillate, residual stocks show sharp drop. . . .

TRANSPORTATION— Petroleum rail shippers see further deterioration of their competitive position as a result of the freight rate increases announced by ICC. . . . Maximum of 6 cents per cwt. applies on tank-car material. . . . Shippers dispute ICC statement that increase averaging 13.4 per cent will yield railroads maximum amount of revenue and enable them to continue to compete with truck, water, and pipe-line movement. . . .

PIPE LINE— Federal Power Commission authorizes $20,107,549 gas-storage project of Michigan Gas Storage Co. . . . Program includes construction of 146 miles of 24-in. transmission line in Michigan. . . . ¶Kansas City hearing continued by FPC on application of Mid-Continent Gas Transmission to build Hugoton-St. Paul-Kansas City line. Cities Service Gas, also planning a 405-mile Hugoton-Kansas City line, asks dismissal of Mid-Continent Gas Transmission's petition. . . .

NATURAL GAS—Oklahoma Corporation Commission issues unprecedented order fixing minimum well-head price of 7 cents for Hugoton field gas. . . . Order climaxes case brought by Peerless Oil & Gas against Cities Service. . . . Court appeal by Cities Service expected. . . . ¶Three more oil organizations—New Mexico Oil and Gas Association, Kansas-Oklahoma division, Mid-Continent Oil and Gas Association, and Panola County (Texas) Royalty Owners Association—vote resolutions asking Congress to restrict the power of the Federal Power Commission. . . .

Welders complete the job of tying in the little big-inch line with the Tennessee Gas & Transmission Co. system near Natchitoches, La., just before the first Texas natural gas went rushing through the lines toward the fuel-hungry East. Tom Evans, district T. G. & T. superintendent, turned the big valve that sent the first gas into the line at 12:45 p.m. December 5. Gas was going into the line at the rate of 50,000,000 cu. ft. daily 72 hours after the Tennessee company was notified its interim bid for the big-inch lines had been accepted in Washington. At right is R. M. Hawkins, division superintendent



Freight Rates on Oil, Products Slated for Stiff Increase

WASHINGTON.—Rail freight rates on petroleum and petroleum products will be increased on January 1 by 20 per cent above the rates prevailing last June, under an order issued last Friday by the Interstate Commerce Commission.

The new rates supersede a temporary increase of 6.5 per cent on virtually all freight granted by the ICC last summer. The higher rates are generally 20 per cent above the former scale, but exceptions for certain commodities and services brings the national average of all railroads to an increase of about 17.6 per cent and is estimated to yield the railroads an additional revenue of $1,000,000,000 yearly which the commission found was justified to meet increased costs. In general, common carriers by water are authorized to make the same increases.

Where oil is shipped in tank cars the increase permitted is 20 per cent but limited to a maximum of 6 cents per 100 lb. This restriction applies to the following products as described in the 1927 ICC order on freight-commodity statistics: crude petroleum, group 360; asphalt, group 370; petroleum tar, group 453; coal tar and other tar, group 701; petroleum and petroleum products, groups 450 and 451.

ICC Decision

In discussing petroleum freight rates, the ICC decision said:

"Lubricating oils and greases and petroleum products, refined, n.o.s., are grouped with Manufacturers and Miscellaneous, and an increase of 25 per cent is proposed (in the railroads' original application for rate revision). These commodities move largely by rail in box cars. This traffic increased in volume from about 3,300,000 tons in 1940 to about 6,500,000 tons in each of the war years; and the revenues increased from $22,000,0000 in 1940 to $60,000,000 in each war year. Among the commodities included in the petroleum list which also move in tank cars are paint oil, petroleum tailings, petroleum-wax tailings, and liquefied petroleum gas. These four commodities and the lubricating oils and greases and specialty products are not nearly so susceptible to competition with other forms of transportation.

"The rail petitioners propose an increase of 25 per cent, subject to a maximum of 6 cents per 100 lb., in the rates on the crude, refined, and low-grade oils moving in tank cars. On tank-car movements of the refined oil, this increase would average about 13.4 per cent, but petitioners believe it will yield them the maximum amount of revenue obtainable on this traffic, by enabling them, as well as the long-haul rail shippers, to continue to compete with carriers and shippers by truck, water, and pipe line.

"On the other traffic in the petroleum list, as to which this competition is not nearly so intense, petitioners propose the general 25 per cent increase. Certain shippers object to the different treatment proposed because it would disrupt long-standing commodity grouping. But as different treatment is necessary to meet the competitive situation, and the commodity grouping has already been largely disrupted by the numerous truck or water-compelled rates applied not only to the refined or low-grade oils, in tank cars, this objection is not regarded as controlling.

"A comprehensive readjustment of the rates on the refined oils, in tank cars, and by pipe line, and on the low-grade oils, in tank cars, from the Mid-Continent field to destinations in western-trunk-line territory was prescribed in 1941 and 1944. The rail shippers, and their customers who were complainants (in those cases) assert that the pipe-line rates prescribed in the first of these cases proved to be amply remunerative and there is no possibility of any increases being sought or made in the pipe-line rates. They oppose any increase in the rail rates there prescribed on the ground that the traffic would be diverted from the rails to other forms of transportation to the injury of rail shippers, consignees, and carriers alike. Such rates were increased 6 per cent on July 1, 1946. Undoubtedly any increase in the rail rates on these commodities will divert some traffic to other forms of transportation, but this alone affords no justification for differentiation in the increase in the rates prescribed in those proceedings (1941 and 1944) and that authorized on other petroleum traffic in the same category."

Though a raise in freight rates had been generally anticipated, Mid-Continent petroleum shippers said the increases announced by the ICC would be another serious blow at the transportation of refined products by rail.

In Tulsa, an informed source with substantial tank-car shipments pointed out the ICC action means a considerable widening of the so-called pipe-line marketing territory where the combined pipe-line and rail rate (from the pipe-line terminal) is lower than the Group 3 rail rate to destination. He cited the Council Bluffs, Iowa, rate. This was 29 cents per cwt. prior to June 30. The increase will bring it to about 35 cents, or 2⅓ cents per gallon, as contrasted to a pipe-line rate of 1 cent.

The following table shows comparative rates per cwt. Gasoline and kerosene are figured at 6.6 lb. per gallon; heavier products at 7.4 lb. per gallon.

	In cents per gallon		
Destination—	Group 3 rail rate prior to June 30	Present rate	Rate after Jan. 1
Milwaukee, Wis.	2.57	2.71	2.97
Madison, Wis.	2.44	2.57	2.84
Duluth, Minn.	2.71	2.84	3.10
Moorehead, Minn. ..	3.37	3.56	3.76
Davenport, Iowa ...	2.18	2.31	2.57
Fort Dodge, Iowa ...	2.11	2.24	2.51

Rates through most of the territory into which large tank-car shipments of lighter refined products are made are included under the 6-cent per cwt. maximum.

It was generally agreed that non-tank-car shipments of heavier products, such as lubricating oil, will not be affected by the increase as will gasoline and kerosene. In the case of the heavier products, the increase is expected to be passed on to the consumer; lighter products will be diverted in increasing quantity to pipe lines with some tank-car shipments continuing to points where pipe-line capacity is insufficient and to points far removed from the pipe-line terminal.

Frey Named Director of A.P.I. Marketing Division

WASHINGTON.—Dr. John W. Frey has been appointed director of the Division of Marketing of the American Petroleum Institute and will take over the post about February 1.

Frey is well known in the petroleum industry, particularly the marketing branch, having held various government posts concerned with this subject. He entered the Government in the Bureau of Mines in 1928 and later served as petroleum specialist in the Commerce Department, was assistant to the administrator of the NRA petroleum code, assistant director of the Petroleum-Conservation Division of the Interior Department, chief of the marketing division and later assistant to the deputy administrator of Petroleum Administration for War, and has been connected with the Oil and Gas Division of the Interior Department since its formation last summer.

International

WORLD-WIDE OIL DEVELOPMENTS

German and Austrian Scientists Imported for Special Research

FUELS and lubricants, a new type of diesel engine, and synthetic-petroleum production are among the research projects being conducted by 270 German and Austrian scientists and technical experts brought to the United States by the U. S. Army.

The program of importing former enemy brains was started in a small way more than a year ago, particularly in connection with the development of rocket weapons, but has proved so successful that it is being expanded and upwards of 1,000 will be brought over to work on a great variety of research projects.

All the experts volunteer for the program. They are carefully screened and come in military custody, but some have earned the right to bring their families here and to apply for immigration visas. The top salary paid is $3,120—considerably below the pay for citizens of equal competence—plus an expense allowance of $6 per day from which they may purchase food and other gifts to send their families in Europe. All work in connection with research projects sponsored by the Government, though some of them are assigned to industrial laboratories.

One group of these technicians is employed in the design of a high-speed, lightweight diesel engine intended primarily as a prime mover for high-powered locomotives. In spite of its light weight, the engine is being designed for rugged service with a minimum of maintenance and repair, and will be adaptable to marine and other requirements as well. It will be a 12-cylinder, V-type engine utilizing a minimum of critical materials. Compact in design and constructed for convenience of inspection, maintenance, and repair, the engine's weight and space requirements will be similar to those of gasoline engines of normal design. Features include a reduced fire hazard in operation, high torque at low speed, and low fuel consumption throughout the entire speed range.

Synthetic-petroleum production is being studied intensively by German scientists with experience and ability in the hydrogenation of coal to produce synthetic-petroleum products, the carbonization of coal and oil shale, and the synthesis of gas by the German Fischer-Tropsch process. Still others are conducting basic and industrial research on various problems of fuel and lubricant production and performance specifications.

Shell Official Says Roads Essential to Recovery

PARIS.—L. T. Kittinger, vice president of Shell Oil Co., Inc., opened the highway meeting of the International Chamber of Commerce here with the statement that road and highway development in all nations is essential to world-wide economic recovery.

As chairman of the highway-transport committee, Kittinger welcomed the 600 delegates. "One of the ways to achieve economic recovery," he said, "is to break down the barriers between peoples, so that trade moves and business functions smoothly. Road and highway development is basic to this concept of prosperity."

Purpose of the Paris meeting, first of its kind since the end of the war, is to reactivate an international highway organization. In his address, Kittinger outlined specific objectives in highway reconstruction. The delegates were asked to render material assistance to the businessmen in their respective nations, to encourage civic and educational organizations to promote highway programs, to urge the establishment of governmental agencies for planning and executing sound road programs, and to develop public support through education. Essential to the program, the speaker declared, were the preparation of studies on financing public-road programs, the promotion of safety through schools and other organizations, and the raising of funds for reputable highway organizations.

"Finally," Kittinger concluded, "by international conventions, we must strive for ease and economy of movement across frontiers, as well as standard and uniform traffic regulations in every nation."

Antilles Brings in New Pitch Lake Producer

Antilles Petroleum Co. (Trinidad), Ltd., subsidiary of McColl-Frontenac Oil Co., Ltd., brought in another producer in the recently developed Tank Farm area north of Brighton field near Pitch Lake on the Island of Trinidad.

The well produced 31.3°-gravity crude from the Naraiva sand, where the six other wells have come in, all between 2,600 and 2,700 ft. Preliminary test showed a daily potential of 743 bbl., higher than the average of the other wells in the Tank Farm area.

Atlantic Brings in New Venezuelan Producer

PHILADELPHIA. — Venezuelan Atlantic Refining Co. brought in its first test well on the Pelayo concession in the state of Anzoategui, Venezuela, early this month. The Venezuelan Atlantic company is doing the drilling for Pantepec Oil Co. of Venezuela, S.A., which is a joint owner.

Drilled to a depth of 7,488 ft., preliminary tests showed a daily potential of 425 bbl. of 30.5-gravity (A.P.I.) oil with a well-head pressure of 700 lb.

Tests are now being made on seven zones some of which are reportedly comparable to the horizons where the first production was obtained.

Presumably more wells will be

drilled in this area when tests of the discovery well are completed. Atlantic is drilling two other tests, one in Monagas and the other in Guarico. These also are on Atlantic-Pantepec concessions. The Pelayo concession is located from 10-15 miles northeast of the Leona field where Mene Grande Oil Co., S.A. (Gulf Oil Corp. subsidiary) has production.

Before March 31, 1947, the Venezuelan Atlantic company will drill, according to agreement, six exploratory wells on Pantepec's wholly-owned concessions in eastern Venezuela, an area of approximately 326,000 acres. This is the Trital block in Monagas.

Russians Plan 360-Mile Gas Line to Serve Kiev

A natural-gas pipe line scheduled to provide the city of Kiev ultimately with 5 million cubic meters (177 million cubic feet) of gas daily is being planned by Russia for completion in the autumn of 1947, according to information received by the Foreign Commerce Weekly, publication of the U. S. Department of Commerce.

According to Soviet press reports, the line will be 360 miles long, extending from Kiev through the provinces of Drogobych, Stanislav, Ternopol, Kamenets - Podolski, Vinnitsa, and Zhitomir to Dashava in the Carpathian mountains of Western Ukraine.

Natural gas of the Carpathian region, which has a reserve estimated at many billions of cubic meters, is found at a depth of 2,000 to 2,500 ft.

Plans Taking Shape for South American Congress

The full range of activities of the oil industry in South America are scheduled for discussion at the first South American Oil Congress to be held by the South American Petroleum Institute the first week in March in Lima.

Five countries—Argentine, Bolivia, Chile, Peru, and Brazil—are expected to send official delegations, though all countries have been invited to participate. Industry representatives are expected from the United States, and Eugene J. Houdry, president, Houdry Process Corp., and Dr. Gustav Egloff, of Universal Oil Products Co., have indicated their intention to take part.

The agendum for the congress lists the following topics: geology and exploration, production, chemistry of petroleums, petroleum refining, transportation and storage of petroleum, consumption and utilization of products, supply and exchange of fuels, hygiene in the industry, legislation and economics of the industry, and teaching in the industry.

Mexico Still Cool to Foreign Oil Interests

MEXICO CITY.—A declaration by Antonio Bermudez, new general manager of Petroleos Mexicanos, that the Mexican oil industry will develop without the help of foreign capital last week apparently set at rest rumors which had circulated since the election of Miguel Aleman to the presidency that American and other oil interests would be invited to return to Mexico.

The announcement by Bermudez coincided with the appointment of two new general assistant managers of Pemex to succeed Manuel Sanchez Cuen. Julio Serrano was named assistant in charge of administrative affairs, and Manuel Amor, engineer and head of the new-projects division of Pemex, was named assistant in charge of technical matters. Amor was in charge of construction of the Atzcapotzalco refinery.

Further changes among personnel and in the organization of Pemex are expected.

Hungary Reports Oil Find

BUDAPEST.—An exploration party has discovered the presence of oil in the Danube-Tiza Basin, about 70 miles southeast of Budapest, according to an announcement last week by the Hungarian Government. The new area, according to reports, lies outside the holdings of the new Soviet-Hungarian Oil Co., formed several months ago.

Troops Clash as Iran Prepares for Election

TEHRAN.—Minor clashes between government troops and local militia along the borders of Mazandaran and Azerbaijan provinces led last week to a decree of martial law in most of the principal cities and towns in Mazandaran as Iran entered a critical 2-week election period.

A new parliament, which is expected to take up the question of the Russian oil concession in northern Iran, will be chosen in the election. Both provinces were at one time occupied by Russian troops and have been the scene of much activity on the part of the pro-Soviet Tudeh party.

A report published in the left-wing Tudeh party's newspaper, Rahbar, that the government had decided to grant oil concessions to American companies in the southern provinces of Beludjistan and Fars was denied by other sources.

French October Imports Include 1,381,410 Bbl. Crude

PARIS. — France imported 186,677 tons (1,381,410 bbl.) of crude oil during October, of which 135,000 tons (999,000 bbl.) came from the Middle East, Iraq, and Arabia. The United States sent 27,177 tons (201,110 bbl.), and 24,500 tons (181,300 bbl.) came from the Caribbean areas.

In the same month, lubricating-oil imports totaled 21,129 tons, of which 19,783 tons came from the United States and 1,228 tons from the United Kingdom. A total of 23,614 tons of gas oil was imported, of which the bulk, or 21,501 tons, came from the United States. Fuel-oil imports were 5,886 tons, of which 1,884 tons came from the United States and 2,894 tons from the United Kingdom.

Of the 96 tons of lubricating oil exported, 65 tons went to Germany, 15 tons to Algeria, and 23 tons to French colonies. Gas-oil exports totaled 4,841 tons, of which 4,105 tons went to French colonies—2,509 tons to Tunisia and 1,596 tons to Algeria. Of fuel-oil imports, 9,437 tons went to Germany, and 9,110 tons to Italy.

(Conversion factor here for a ton is 7.4 bbl.)

Peruvian Concession Studied

LIMA. — A bill granting International Petroleum Co., a Standard Oil Co. (N. J.) subsidiary, a concession to explore potential oil regions in the Sechura Desert of northern Peru is under consideration by the Peruvian Senate. The bill already has been passed by the house.

Stock Issue to Acquire Taylor Refining Sought

NEW YORK.—Stockholders of Petroleum Heat & Power Co. will be asked to authorize issuance of 1,000,000 additional shares of common stock to be exchanged for the entire capital stock of Taylor Refining Co., at a meeting here December 23.

K. G. MacCart, president, said the move is contemplated because of the necessity to "enlarge and better integrate" the heat and power company's sources of oil supply.

Taylor Refining operates a 25,000-bbl. refinery at Corpus Christi and owns a 50 per cent interest in Coastal Refineries, Inc., which operates a refinery at Port Isabel, Tex. Combined storage of Taylor and Coastal is in excess of 2,200,000 bbl. Both companies are engaged in the production of oil and natural gas in Texas fields.

Increase of 16 Per Cent Foreseen In World Demand by 1950

by Eugene Holman

LET me appraise as briefly as I can the situation in which the oil industry finds itself today and our prospects and goals for the future.

First, a summary of current position:

Sales of petroleum products in the United States are higher than they have ever been.

In other words, a greatly increased peacetime demand for petroleum products has more than made up for the sudden shrinking of wartime requirements. Reasonable prices have prevailed in spite of these new demands.

In its persistent application of scientific research and development—before the war, during the war, and since the war—the oil industry has made steady progress toward better use of its raw material. These advances have extended supplies and reduced costs. Resulting benefits have, over the years, been passed on to consumers in lower prices and better products.

Out of this continuous research have come other significant—and sometimes spectacular — developments. New enterprises have been born to handle products that we have found can be made from oil—synthetic rubber, fertilizers, solvents, insecticides, waxes, alcohols, and a host of others.

But the principal use of petroleum today is still as a fuel. Our business is selling energy, and we are more than holding our own in this highly competitive field. Less than 50 years ago oil supplied only one-twentieth as much of the nation's total energy as did coal. Today, oil supplies over half as much.

Current-Demand Picture

Let me give you a quick statistical picture of current demand for oil.

Excluding Russia, the world's requirements for oil during this year will total about 7,200,000 bbl. daily.

Over 75 per cent of the world's merchant fleet burns oil today—as compared with 4 per cent in 1914.

Diesel horsepower installed in the United States increased from 5,500,000 in 1935 to 45,000,000 at the beginning of 1946. During that time, oil-heating units in homes have grown from about 1,000,000 to over 2,000,000.

Now, what about the future?

World demand for oil, again excluding Russia, is expected to increase

International
WORLD-WIDE OIL DEVELOPMENTS

Eugene Holman is president of Standard Oil Co. (N. J.). The talk presented on this page was given last week at a meeting of the National Association of Manufacturers in New York

to about 8,350,000 bbl. per day by 1950—an increase of 16 per cent. Ability of the industry to meet this demand will be largely determined, it seems to me, by three things:

1. Will there be adequate quantities of petroleum?
2. Will oil technology keep pace with general progress?
3. Will the employer - employe teamwork necessary for maximum efficient production and distribution be maintained?

Let's look at each of these three questions in turn.

The future holds plenty of liquid fuel. Our geologists believe that in this country alone we will discover new reserves of oil at least equal to the vast quantities already discovered. The truth of the matter is that, under the stimulus of vigorous competition and the profit system, the art of finding oil has been steadily improved. Furthermore, we have learned how to extract more of the oil we find. A few decades ago it was not unusual to recover only about 20 per cent of the oil in a new field. Today, we recover as high as 80 per cent.

Also, this country possesses large reserves of natural gas almost equal in energy value to proved reserves of petroleum. Modern science has taught us how to convert this natural gas to gasoline at a cost already approaching the cost of gasoline from oil. And back of these reserves are the country's shale oil and coal, which are great sources of liquid fuel.

We may look forward to the steady development of oil resources in other parts of the globe. If imports are needed, they can supplement our domestic supply and enable us to keep production of our own fields at maximum efficient rate.

We are hopeful, too, about the rewards of continuing research and development. We are already prepared with equipment and processes to produce the new high-octane fuels of tomorrow—just as soon as the automobile industry can produce the cars to take advantage of them.

Fortunate Employe Relations

As most of you know, the oil industry has been particularly fortunate in its employe relations. Over the past 2 or 3 decades there has developed a general willingness among employers and employes to sit down together and find solutions to the human problems created by modern industry. Out of this spirit and practice of cooperation have come good wages, healthful working conditions, thrift plans, annuity benefits, and insurance. Productivity, aided by technological advances, has increased. Most important of all, a practical basis has been established for continued progress toward the goals of all of us who work for a living—better opportunities for individual improvement and advancement, more satisfactory safeguards against insecurity.

We believe that men can learn to do a better job of getting along together. We are determined as practical men and women to do our best to that end.

Now if this quick appraisal of the outlook for oil in the world of tomorrow sounds optimistic to you, it is because the facts themselves make it so. The hundreds of thousands of American men and women all over the world who make their living out of oil have played a significant part in bringing a new standard of living to their fellow citizens and neighbors. Because they have seen their own efforts bring the American oil industry to a position of world leadership in finding oil, adapting it to human use, and getting oil products to consumers at ever lower costs, they know the great benefits of human freedom and the stimulus of vigorous free competition.

These people—the people of the oil industry—with confidence in the American pattern of individual freedom and competitive enterprise, approach the challenge of tomorrow with hope and enthusiasm.

Texas A.I.M.E. Sections Will Hold State-wide Joint Meeting

PETROLEUM - engineering students at the University of Texas will serve as hosts to petroleum engineers from Texas and other parts of the Southwest December 18-19 in Austin when the five Texas local sections of the American Institute of Mining and Metallurgical Engineers hold their first state-wide joint meeting, it was announced by Dr. H. H. Power, chairman of the university's petroleum-engineering department.

Recent growth in the A.I.M.E. has brought about the formation of three new Texas local sections in the last 2 years. The meeting was conceived by the Texas University Student affiliated society.

The 2-day technical program will be climaxed by a dinner December 19. Dr. E. L. DeGolyer, Dallas, will give the principal address, "Early Oil Experts," and Herbert F. Beardmore, A.I.M.E. Petroleum - Division chairman, will speak.

The technical program includes 12 papers primarily concerned with gas development and conservation and pressure maintenance. Two of the papers scheduled are by students at Texas University and Texas A. & M. College and will be placed in competition for a cash prize offered by the Gulf Coast Section. The visiting engineers will also be addressed by T. S. Painter, university president, and W. R. Woolrich, dean of engineering at the University.

The program includes the following papers and authors and was assembled by a committee headed by F. B. Plummer and George H. Fancher:

"Gas Conservation Practices in West Texas," D. V. Carter, Magnolia Petroleum Co., Dallas; "The Utilization of Residue or Oil-Well Gas in Connection With the Texas-California Gas Pipe Line," W. K. Davis, El Paso Natural Gas Co., El Paso; "Gas Developments and Trends in South Texas," C. R. Williams, vice president, The Chicago Corp., Corpus Christi; "Valuation of Gas-Condensate Reservoirs for Cycling," W. H. Justice, Tide Water Associated Oil Co., Houston; "A Reservoir Study of the West Edmond Hunton Pool, Oklahoma," Max Littlefield, L. L. Gray, and A. C. Godbold, Gulf Oil Corp., Tulsa; "Our Auxiliary Petroleum Reserves," H. H. Power, chairman, department of petroleum engineering, University of Texas; "Salt-Water Injection and Pressure Maintenance, East Texas Field," Winfield S. Morris, vice president, East Texas Salt Water Disposal Co., Kilgore; "What Management Expects of an Engineer," A. C. Rubel, vice president, Union Oil Co. of California, Los Angeles; "What Engineers Expect of Management," Ernest K. Parks, consultant, Los Angeles; "The Calculated Effect of Pressure Maintenance on Oil Recovery from a Solution-Gas-Drive Reservoir," Robert L. Hoss, graduate student, University of Texas; "Gas Conservation—a General Plan," William G. Gill, petroleum-engineering student, Texas A. & M. College; "The Engineer as a Supervisor," Thomas C. Frick, Atlantic Refining Co., Greggton, Tex.; and "Corrosion in High-Pressure Gas-Condensate Wells," Jack W. Waechter, petroleum-engineering student, University of Texas.

W. S. MORRIS

W. K. DAVIS

Authors of papers to be given at the first state-wide meeting of Texas A.I.M.E. sections December 18-19 in Austin include W. S. Morris, vice president, East Texas Salt Water Disposal Co., Kilgore, and W. K. Davis, El Paso Natural Gas Co., El Paso

New Mexico Association Withdraws Approval of Anglo-American Treaty

ARTESIA, N. M.—Members of the New Mexico Oil and Gas Association at their annual meeting here last week withdrew their previous indorsement of the Anglo - American oil agreement and went on record for an amendment to the Natural-Gas Act to restrict the authority of the Federal Power Commission.

The action in regard to the Anglo-American agreement was similar to that taken by the Independent Petroleum Association of America at its Fort Worth meeting in October. The resolution of the New Mexico association left further action in connection with the agreement to the individual judgment of members of the organization.

The second resolution condemned the encroachment of FPC upon the field of production, processing, gathering, and compressing of gas and recommended that the act be amended in such a manner as to adequately define and properly restrict the authority of the commission.

Principal speaker at the banquet concluding the all-day meeting was B. A. Hardey, I.P.A.A. president. Hardey expressed satisfaction with the progress made by the industry since V-J day in bringing the industry back to a sound economic basis but at the same time warned that the problems of the industry are recurring ones and that their solution demand a united front by all segments of the industry.

All officers and members of the executive committee of the association were reelected. They include Van S. Welch, president; Emery Carper, vice president; Harry Leonard, treasurer; and Jack M. Campbell, executive secretary.

Murray Designated for Texas Commission

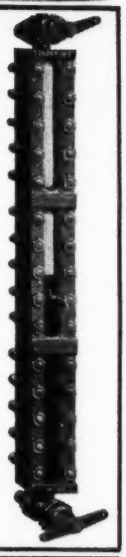
AUSTIN. — William J. Murray, Jr., Houston, has been designated by Gov.-elect Beauford H. Jester to become his successor as a member of the Texas Railroad Commission. Jester will retire January 21 to become governor.

Jester said the oil, gas, and trucking industry of Texas has indicated approval of Murray and that his appointment had already been approved by Sen.-elect W. Lacy Stewart of Houston, a requisite for Senate confirmation. Such confirmation would carry Murray in office until January 1, 1949. To finish Jester's term on the commission, which expires January 1, 1951, Murray would have to be elected commissioner in 1948.

Following graduation from the University of Texas, Murray was instructor in the department of petroleum engineering there, and later became petroleum engineer and geologist in West Texas. He is well acquainted with the Oil and Gas Division's work, having served as chief oil and gas enforcement officer at Kilgore, Mount Pleasant, Palestine, and Jefferson, Tex.; as deputy supervisor in engineering and conservation in the commission's East Texas district; and as senior petroleum engineer for the Oil and Gas Division.

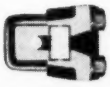
Murray was serving as chief engineer and examiner for the oil and gas division when he entered federal service in 1941 as conservation engineer for the Petroleum Administration for War, assigned to Texas, New Mexico, Louisiana, Mississippi, and Alabama. He held this position until July 1943.

PENBERTHY
"REFLEX"
DROP FORGED STEEL LIQUID LEVEL GAGES



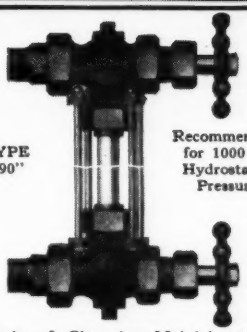
Liquid always shows black—empty space shows white. Preferred where the liquid level must be easily and positively visible, and when liquids are under high pressure or at high temperature. Made of alloy temperature resisting steel and are highest quality throughout. Liquid chamber made from solid block of steel to assure perfect alignment and rigidity. Conform with A.P.I.—A.S.M.E. requirements.

The "Reflex" is one of the complete line of Penberthy Gages that meet every liquid level gage requirement.



PENBERTHY INJECTOR CO.
DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO

PENBERTHY
DROP FORGED STEEL LIQUID LEVEL GAGES



TYPE "90"

Recommended for 1000 lb Hydrostatic Pressure

Made of Chromium-Molybdenuin alloy temperature resisting steel, extra heavy throughout and stainless steel trimmed. Positive automatic shut-off; stainless steel balls shut off the flow of liquid if glass breaks. Regrinding removable seats, heavy duty stuffing boxes, union connections. Conform with A.P.I.—A.S.M.E. requirements.

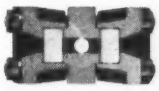
This is one of the complete line of Penberthy gages that meet every liquid level gage requirement.

PENBERTHY INJECTOR CO.
DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO

PENBERTHY
"TRANSPARENT"
DROP FORGED STEEL LIQUID LEVEL GAGES

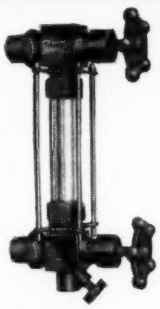
Used to observe color and density of liquids under high pressures and/or temperatures. Construction exceptionally sturdy. Made of alloy temperature resisting steel, and are highest quality throughout. Liquid chamber made from solid block of steel to assure perfect alignment and rigidity. Conform with A.P.I.—A.S.M.E. requirements.

The "Transparent" is one of the complete line of Penberthy gages that meet every liquid level gage requirement.



PENBERTHY INJECTOR CO.
DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO

PENBERTHY
"ALL IRON"
LIQUID LEVEL GAGES



Body made from a special high strength alloy iron, shanks alloy steel and trim stainless steel. Extra heavy construction throughout, automatic and positive shut-off if glass breaks, heavy duty stuffing boxes. Conform with A.P.I.—A.S.M.E. requirements.

The "All Iron" is one of the complete line of Penberthy gages that meet every liquid level gage requirement.

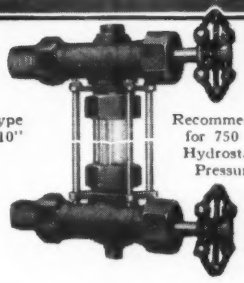
PENBERTHY INJECTOR CO.
DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO

PENBERTHY
QUALITY PRODUCTS

Penberthy injectors—ejectors—automatic electric and water (or steam) operated sump pumps are all widely used throughout the oil industry because they have always been dependable under the most severe service conditions.
All are of rugged construction and made by an organization with 59 years experience in the manufacture of highest quality products.

PENBERTHY INJECTOR CO.
DETROIT 2, MICH. Canadian Plant WINDSOR, ONTARIO

PENBERTHY
DROP FORGED STEEL LIQUID LEVEL GAGES



Type "10"

Recommended for 750 lb. Hydrostatic Pressure

Steel construction throughout with stainless steel interior trim. Automatic shut-off is positive and instantaneous; stainless steel balls shut off the flow of liquid when glass breaks. Heavy duty stuffing boxes, union connections, offset construction facilitate cleaning and simplify glass replacement. Conform with A.P.I.—A.S.M.E. requirements.

This is one of the complete line of Penberthy gages that meet every liquid level gage requirement.

PENBERTHY INJECTOR CO.
DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO

Trends in Application of Electric Power Described at Conference

SEVERAL additional discussions, mainly dealing with new opportunities for the use of electric power in the petroleum industry, were heard by members and guests of the Petroleum Electric Power Association last week in Tulsa as the organization's eighteenth annual conference was brought to a close.

Approximately 100 representatives of electric utilities, equipment firms, and oil companies attended the 2-day meeting, the first conference program of its kind held since 1941. The association elected Paul Griffith, Pine Bluff, Ark., industrial sales department, Arkansas Power & Light Co., as its new president, and selected Corpus Christi for the 1947 conference.

Other new officers chosen were A. R. Watson, Amarillo, industrial manager, Southwestern Public Service Co., association vice president; and C. L. McNeese, Houston, power-sales engineer, Houston Lighting & Power Co., association secretary-treasurer. Named to the board of directors were P. M. Cordell, Fort Worth, manager, industrial sales, Texas Electric Service Co.; James E. Moody, Shreveport, power engineer, Southwest Gas & Electric Co.; O. W. Jones, Corpus Christi, director, industrial development, Central Power & Light Co.; R. E. Frye, Wichita, industrial-sales manager, Kansas Gas & Electric Co.; and T. E. Graham, Oklahoma City, power engineer, Oklahoma Gas & Electric Co. The new president, Griffith, succeeds H. C. LeVois, Port Arthur, sales superintendent, Gulf States Utilities Co., who was presented a certificate in recognition of his services to the organization.

W. H. Stueve, Oklahoma City, chief industrial consultant, Oklahoma Gas & Electric Co., long prominently identified with activities of the association, told the group at the meeting that available data disclose a definite trend toward use of more power in oil refineries.

Stueve's topic was "Refiners' Viewpoint of Electric-Power Usage." He presented several charts and other statistical data in discussing over-all trends in power usage. His paper will be published in full in an early issue of The Oil and Gas Journal.

War-Gained Experience

Some of the other papers at the conference were reported last week, The Oil and Gas Journal, page 76, December 7. Additional discussions included the one given by A. N. Horne, Tulsa, vice president and assistant manager, Texas-Empire Pipe Line Co., on "Future Use of Electric Power for Pipe-Line Pumping."

Horne told the group that experience gained in construction and operation of the big-inch and little big-inch pipe lines during the war has justified the trend toward larger-diameter lines and fewer pumping stations for trunk-line movement of crude and products. This experience and other developments has made obsolete the use of multiple lines from the standpoint of moving multiple grades, he asserted.

"For many years trunk pipe lines were of 6 and 8-in. diameter with station spacing of 35 to 40 miles, operating at 750 to 800 psi. and additional load required looping or multiple lines with additional equipment at each pump station, and usually additional labor for operation and maintenance," he said.

"The successful development and application of the centrifugal pump to pipe-line operation paved the way for lower initial investment, elimination of tanks, and reduction of labor maintenance costs, with greater flexibility of operation. Therefore, as a result of the foregoing developments and experience, the logical conclussions for over-all economy of operations indicate (1) larger - diameter lines; (2) fewer pump stations, and (3) simplified pumping equipment. To attain the fullest economy in application of these three factors, the cost of fuel or power for the prime movers must be comparable."

Horne said it is an "unquestioned fact" that electric drive requires lesser initial investment and cost for replacement and repair parts and maintenance and operating labor is below that for other type equipment. Therefore, he continued, the problem of the future use of electric power for pipe-line pumping resolves itself into a comparison of costs of fuel for internal combustion engines and electric-power costs.

The Texas-Empire official presented a detailed tabulation showing cost factors involved in the electrified operations of the Government's big-inch lines. "The future use of electric power for pipe-line pumping rests almost exclusively with the power companies, which means that the final answer is the ultimate cost to the pipe-line companies," he continued.

Engineering technique in laying out a distribution system for oilfield production operations were outlined by J. N. Poore, Dallas, petroleum specialist in the industrial division of General Electric Co. Emphasizing the importance of the distribution system, Poore said two-thirds of the initial cost of an electrical system is in the distribution system with the remaining one-third in motors and controls.

Poore recommended low - voltage secondary system and short feeder lines to reduce voltage drop. Capacitors, he continued, offer savings and reduce system losses. Every installation should be investigated to see if capacitors are justified. He outlined a unit load-unit-length principle in a model field, and said aluminum conductors should be investigated in all fields from the standpoint of economics.

New officers of the Petroleum Electric Power Association: C. L. McNeese, Houston Lighting & Power Co., association secretary-treasurer; Paul Griffith, Pine Bluff, Ark., Arkansas Power & Light Co., president; and A. R. Watson, Amarillo, Southwestern Public Service Co., vice president

Repressuring Planned

Applications to install repressuring plants for three South Texas oil fields will be heard by the Texas Railroad Commission, January 21.

NALCO SURVEY REPORTS GET

fast action!

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"We have studied your reports with great interest (and surprise), and are immediately going to work on many of the trouble spots in our water treatment system . . . Again I wish to thank you for this Nalco survey and assure you that these reports are responsible for our increased effort toward water treatment control . . ."

Nalco Survey Reports usually get fast action because they present a *complete* picture of your specific plant water treatment system . . . A picture that, in many instances, shows plant engineers exactly what immediate measures must be taken to get top plant operating efficiency through better water treatment and control methods.

Now and then a Nalco Survey Report goes back with a single recommendation: *Keep up the good work!*

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New methods and improved control procedures are the sole business of the Nalco Slime and Bacteria Control Laboratory.

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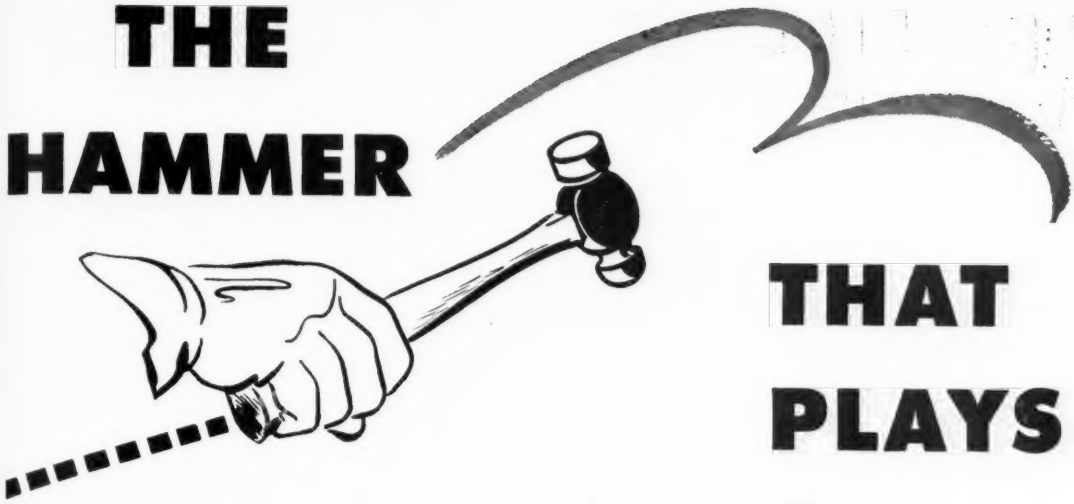
The Scientific System of Water Treatment for the Petroleum Industry

Nalco

THE HAMMER THAT PLAYS A SAFETY TUNE



High up on a tower... a UOP inspector hammers away. As he moves up along the pipe the musical ring of his hammer suddenly becomes dull... less musical. Perhaps you wouldn't notice it... but he does. He's located a potential danger point... something that needs attention. And he carefully marks the spot and records the location for further examination.

He's one of a crew of UOP experts... men who make periodic inspections of UOP licensed units. And this is but one of the methods used for detecting weak points. These inspectors are equipped with a variety of instruments and testing devices to determine wall thickness, corrosion, and other conditions demanding attention.

It's no superficial inspection they make. It's thorough. Units are carefully examined... oil furnaces inspected... lines checked for signs of corrosion... pipe and vessel walls calipered... valves examined... every indication of weakness explored. And a complete report is submitted together with recommendations for correcting unsafe conditions.

This is just one phase of UOP service... and a mighty important one. It's a service that insures maximum safety of operation... increases operating time efficiency... cuts accident hazards to a minimum. It's a service that every UOP licensee receives, and ample evidence, we believe, of our lifetime interest in the successful operation of the refineries we serve.

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WASHINGTON WATCHING

BY HENRY D. RALPH

Prospects for the Big Inch

WASHINGTON.—Sale of the big-inch pipe lines for natural-gas transmission now seems a certainty if War Assets Administrator Littlejohn goes through with his announced plan of making a new policy report to Congress and asking new bids.

There is a possibility that Congress may object to the new report and hold up disposal, particularly if pressure is brought by coal and railroad interests or if the Federal Power Commission should recommend against any transmission of gas into coal-producing and consuming areas. However, Congress will be very busy with other things the first 30 days of its new session, and the failure of both House and Senate to take positive action would permit the new policy to take effect.

Purchasers will have to take their chances of getting a certificate for gas use from FPC and clearing the right-of-way across state-owned lands in Pennsylvania, but most of the first batch of bidders did not consider these insurmountable obstacles.

There remains the possibility that the purchaser will be free to use the lines for either oil or gas or both as he desires. This would keep open the threat of upsetting the oil economy of the upper Ohio Valley region if they are used to bring in products from southwestern refineries. Two or three of the oil bidders proposed to do this, and Big Inch Oil, Inc., claimed it could make a profit running Texas crude all the way through to the Atlantic seaboard. However, if this company should be the highest bidder on the final round, and get the lines with no restrictions on their use, the chances are it would convert them both for gas.

The Same Old Ickes

THE old Curmudgeon hasn't changed a bit," was the general comment in the committee room when Harold L. Ickes finished reading his prepared blast about the big-inch pipe lines.

He attacked just about everyone connected with the disposal problem, and some who aren't. He praised his own role as "father of big-inch," and claimed to have originated the idea that the lines could be used for gas. He imputed sinister motives or gross stupidity to all officials involved. He used the committee as a sounding board to lash out against his old enemy, John L. Lewis, and Lewis' friend, Reconversion Director John R. Steelman whom he described as "District 51 of the United Mine Workers." In a series of labored wisecracks and innuendos bordering on the libelous, Ickes tossed off references to the "private greed" and "snares" of oil operators who don't want the lines used for oil, the "machinations of certain coal interests," and a "phony bid on a dollar-down-and-the-rest-when-you-can-catch-me basis."

With more than his usual inconsistency, Ickes vilified the independent refiners in the interior for opposing oil use of the lines, but also implied that major oil companies were secretly scheming to get control of the lines to put a "squeeze play" on these same independents. He ridiculed the Surplus Property Administration's report for recommending oil use, and then castigated Administrator Littlejohn for throwing it out. He criticized his successor, Secretary Krug, for delay in sponsoring interim gas use of the lines during the coal strike, and then accused him of undue haste in accepting the proposal of Tennessee Gas & Transmission Co. Three minutes after brutally attacking WAA for even considering the bid of Big Inch Oil, Inc., he unmercifully lashed Krug for not accepting this same group's interim-lease proposal. Hinting that T. G. & T. is controlled by Standard Oil Co. (N. J.), he accused Krug of "playing ducks and drakes with the antitrust laws and making the big-inch pipe lines, built and owned by the people, servitors of the great Standard Oil Co."

Standard promptly denied that it has any financial or corporate connection, direct or indirect, with T. G. & T., or that it has any interest in what happens to the big-inch lines. Director Steelman wrote the committee that he had no connection with the disposal matter and had taken no part in any of the negotiations. The committee itself appeared to take no interest whatever in Ickes' testimony, and all the spectators either laughed or swore as he left the witness stand.

Continued Lead Controls

CONTROLS on metallic lead may be among those few kept in force clear through the first quarter of 1947. Most producers and users favor dropping the lead-conservation order, M-38, together with inventory controls and the Government set aside for special allocation.

But officials are inclined to the view that removal now would permit too much lead to get into nonessential uses, such as lead soldiers, without being of any real benefit to permitted users. While the lead supply shows signs of improving since removal of price and import controls and the end of a long strike at some domestic mines, the total available is less than the allocations for various end uses during the present quarter. As long as this condition prevails, removal of allocation would do no good because user industries cannot obtain their full quotas anyway. The supply outlook for 1947 is considerably better, but still far below the expected demand.

Retention of end-use controls maintains some sort of balance, or at least shares the misery, among such essentials lead consumers as ethyl fluid, automobile batteries, telephone cable, and insecticides. The tetraethyl order, L-355, which limits the octane rating of motor gasoline containing lead, probably will be retained as long as the basic M-38 order.

The Decontrol Victory

THE battle to drop government wartime controls over industry has been won, in the opinion of John D. Small, retiring head of the Civilian Production Administration, who has already won his own personal battle to fold up his agency and quit his job. For months he has been leading the fight against those in Government who wanted to retain federal powers to guide reconversion and he didn't want to pull out until he was sure his views would prevail.

Now the remnants of CPA and OPA are being dumped into a residual agency for purposes of liquidation, and most of the emergency housing program will probably follow. Various types of remaining controls will be dropped rapidly in the next few weeks, but a few are almost certain to continue to the end of the Second War Powers Act, March 31.

Among these are inventory controls, which don't really hurt anyone and do prevent hoarding and further unbalance of the economy. Some, but not all, export controls will remain, chiefly to keep essentials from being drained off into higher-price markets abroad. Most of the steel allocations will be liberalized, if not abandoned, before spring.

Now that Wilson Wyatt has re-

signed as national housing expediter, after failing to get full administration support for his program of strict regulation of the housing industry, controls of industrial and commercial construction will begin to loosen. The prevailing view in officialdom now is that such construction has been held down too low, and if restrictions are not eased within a few months the result will be unemployment in the heavy-building trades and equipment industries. Also, that the nation desperately needs new factories and similar construction, while the home-building industry now has a good head start and the output of most building materials is increasing phenomenally. By spring it is probable that the only priorities left in the construction field will be for veterans to acquire materials for homes they are building themselves for their own occupancy.

New legislation will be asked to continue a few special controls after March 31, notably on the allocation of tin and the use of natural and synthetic rubber. However, such new legislation will be selective, retaining only specific authority and letting everything else go by the boards.

Growth of the Oil Co-ops

PETROLEUM cooperatives on the whole had a relatively more successful year in 1945 than did retail store co-ops or the entire co-op movement, according to a brief study just completed by the U. S. Department of Labor. Incomplete reports indicate that co-ops reached a new high point in 1945 as regards membership, distributive volume, and value of sales, but their earnings were somewhat below 1944.

The department estimated that in 1945 there were 4,550 local retail distributive co-ops with 1,760,000 members and $657,500,000 of sales; of these, 1,500 were petroleum associations, which had 910,000 members and sales totaling $290,000,000. Similar breakdowns are not presently available for wholesale and production co-op federations.

Production of all products by central cooperatives was valued at $29,000,000 in 1943 and $60,577,789 in 1945. Refined petroleum products represented 23 per cent of the total in 1943, and 42.7 per cent in 1945, showing that the oil end is growing faster than the rest of the co-op business. In 1945 these central cooperatives produced crude oil valued at $1,438,027; refined petroleum products, $25,852,711; lubricating oil, $4,369,325; and grease, $183,023. This group together constituted 52.3 per cent of the entire 1945 production of central cooperatives, reflecting the cumulative acquisition of oil-producing land and petroleum refineries during the past few years.

Oklahoma Commission Sets Minimum Gas Price

OKLAHOMA CITY.—In a historic action, the Oklahoma Corporation Commission this week set a minimum price of 7 cents per 1,000 cu. ft. at the well head for natural gas gathered from Guymon-Hugoton field.

The ruling, which immediately attracted wide attention, was on an issue which arose during a case brought by Peerless Oil & Gas Co. to require Cities Service Gas Co. to make pipe-line connections to two of its wells in the field and which took 17 days of the commission's docket last summer.

The order was made effective January 1 and fixed the measurement unit at a 14.65-lb. pressure base. Rates paid for gas from the field now average about 4 cents per 1,000 cu. ft.

Redford Bond, commission chairman, declared a price of "less than 7 cents per 1,000 cu. ft. at a pressure of 14.65 lb. constitutes both economic and physical waste of a natural resource."

It was the first time in the state's history the commission had established a field-wide price for oil or gas. Opponents of the proposal were expected to appeal the order to the state Supreme Court. The order directed Cities Service to make a connection to the two wells in question and to take gas ratably from the wells at the newly established price.

Mid-Continent Group Asks Curbs on FPC

A resolution calling for amendment of the Natural Gas Act to deny the Federal Power Commission authority to regulate the production or gathering of natural gas, its sale by producer or gatherer, or its end use was passed last week in Tulsa at the annual membership meeting of the Kansas - Oklahoma Division of the Mid-Continent Oil and Gas Association.

In a subsequent meeting of the executive committee, all division officers, headed by President F. M. Porter, were reelected.

Twelve new members were elected to the association's executive committee and four named to the board of directors.

New executive committee members are I. A. Anson, Bell Oil & Gas Co.; Glenn F. Bish, Ohio Oil Co.; B. C. Clardy, Stanolind Pipe Line Co.; M. J. Heald, The Texas Co.; F. W. Peters, Oklahoma Natural Gas Co.; M. F. Waters, Hanlon Oil Co.; George H. Lang, Beacon Drilling Co.; and H. J. Woolslayer, Lee C. Moore & Co., Inc., all of Tulsa; D. R. Knowlton, Knowlton Engineering Co.; and T. H. Marshall, Anderson-Prichard Oil Corp., both of Oklahoma City; Bert Sutton, Jr., Reda Pump Co., Bartlesville; and Fred R. Whitten, Halliburton Oil Well Cementing Co., Wichita.

Bish, Heald, Marshall, and Peters were named to the board of directors.

A.P.I. Public-Relations Committee Chosen

NEW YORK.—Headed by John M. Lovejoy, president of Seaboard Oil Co. of Delaware, an expanded nation-wide petroleum public-relations committee has been named by William R. Boyd, Jr., president of American Petroleum Institute.

This new committee will be policy-making in scope and will supervise the A.P.I. $1,000,000 public-relations program insofar as finances, organization, and conduct are concerned. Several subcommittees are to be named to deal with various phases of the proposed program.

Membership of the general committee follows:

East.—R. H. Colley, Atlantic Refining Co., Philadelphia; J. Frank Drake, Gulf Oil Corp., Pittsburgh; Eugene Holman, Standard Oil Co. (N. J.), New York; Alexander Fraser, Shell Oil Co., Inc., New York; W. S. Hallanan, Plymouth Oil Co., Pittsburgh; B. Brewster Jennings, Socony-Vacuum Oil Co., Inc., New York; W. A. Jones, Cities Service Co., New York; H. A. Logan, United Refining Co., Warren, Pa.; J. Howard Pew, Sun Oil Co., Philadelphia; W. S. S. Rodgers, The Texas Co., New York; Earle W. Webb, Ethyl Corp., New York; Ralph T. Zook, Sloan & Zook, Bradford, Pa.

Mid - Continent.—K. S. Adams, Phillips Petroleum Co., Bartlesville, Okla.; T. H. Barton, Lion Oil Co., El Dorado, Ark.; C. L. Henderson, Vickers Petroleum Co., Wichita, Kans.; B. L. Majewski, Deep Rock Oil Corp., Chicago; W. G. Skelly, Skelly Oil Co., Tulsa; W. K. Warren, Warren Petroleum Corp., Tulsa; L. S. Wescoat, Pure Oil Co., Chicago; R. E. Wilson, Standard Oil Co. (Ind.), Chicago.

Texas.—J. L. Hamon, Cox & Hamon, Dallas; B. A. Hardey, Independent Petroleum Association of America, Shreveport; George A. Hill, Jr., Houston Oil Co., Houston; C. F. Roeser, Roeser & Pendleton, Inc., Fort Worth; H. C. Wiess, Humble Oil & Refining Co., Houston.

Rocky Mountains.—W. H. Ferguson, Continental Oil Co., Denver; Henry D. Moyle, Wasatch Oil Refining Co., Salt Lake City; Paul Stock, Yale Petroleum Co., Cody, Wyo.

Pacific Coast.—L. L. Aubert, Bankline Oil Co., Los Angeles; R. G. Follis, Standard Oil Co. of California; W. F. Humphrey, Tide Water Associated Oil Co., San Francisco; A. C. Mattei, Honolulu Oil Corp., Ltd., San Francisco; Ralph B. Lloyd, Lloyd Corp., Ltd., Los Angeles; Reese H. Taylor, Union Oil Co. of California, Los Angeles.

Ceremony Marks Transfer Of New Tanker to Sinclair

BALTIMORE.—The S.S. George MacDonald, fifteenth tanker built by Bethlehem Steel Co. for Sinclair Refining Co., was presented the company in a ceremony at Bethlehem's Baltimore yard December 7.

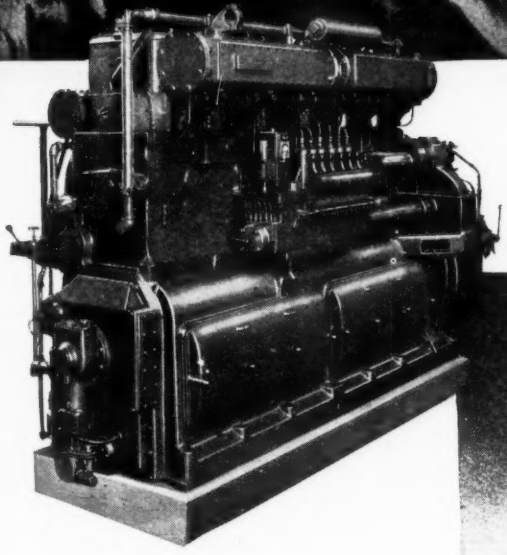
What Kind of Power for Pipe Lines?

To get the answer to this question, consider these facts:

1. Pipe lines need power that is always available. *Immediate* power, when and as wanted. *ALCO diesel engines satisfy that.*
2. Pipe lines need pumping station power plants that are as free as possible from all complications. *ALCO diesel engines satisfy that.*
3. Pipe lines need a type of diesel engine that is inherently rugged—a diesel engine from which you can confidently expect reliable service over a long period without coddling. *ALCO diesel engines satisfy that.*

For these reasons, ALCO diesel engines are most advantageous for many power applications, stationary or marine. Write for data regarding any pipe line or other power purpose you have in mind.

American Locomotive Company, 30 Church Street, New York 8, N. Y.



American Locomotive

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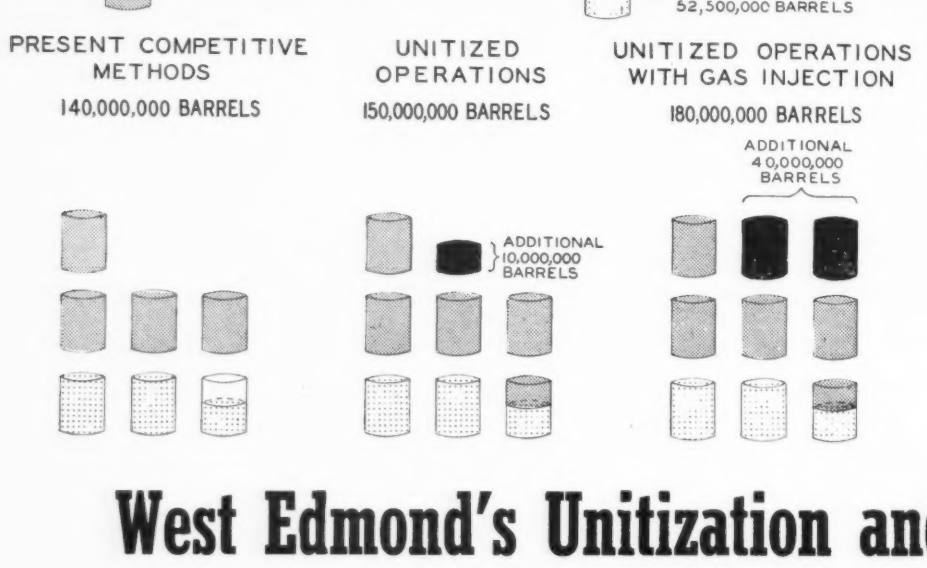
THE MARK OF MODERN ENGINEERING



Here the future reserves for the West Edmond pool are portrayed as (1) under present operation, (2) the 10,000,000-bbl. gain (11.4 per cent) that would be effected by unitization, and (3) the 40,000,000-bbl. gain (45.7 per cent) for the unit with gas injection. Some engineers compute the latter as totaling 80,000,000 bbl. (91.4 per cent gain)

by Kenneth B. Barnes

West Edmond's Unitization and Gas Injection Project Would Be One of Largest

WEST EDMOND is one of the largest "pending" unitization and gas injection projects in the country. This pool now contains 29,400 proved productive acres and 735 Hunton lime wells which average approximately 7,000 ft. in depth. It is one of the major sources of crude supply in the Mid-Continent area.

As a pending unitization and gas-injection project, exhaustive studies of reservoir and producing conditions by a large group of engineers and geologists of the different operating companies are complete. Not only have these studies been on probably the largest scale for such an undertaking in the Mid-Continent up to this date, but the plans and computations for unitization also have entailed much effort. All told, this preparatory work has been carried on continuously since the pool was drilled and developed sufficiently to obtain, correlate, and utilize the reservoir and production data on a field-wide basis. A total of 32 operators and 305 leases, ranging from 40 to 320 acres in size, are involved. Final assembly of the data, computations, and plans has been in the hands of the engineering-geological subcommittee of the West Edmond operators steering committee.

At the present time the unit plan and the initial gas-injection program accompanied by the pool studies are being reviewed by the operators for what may be the last of many times before submittal to the Oklahoma Corporation Commission for hearing and approval on the matter. The application for hearing perhaps may be made even this month as many connected with the field point out that with the discovery date being back in April 1943 and the past involving a continuous drop in reservoir pressures and a constant rise in gas-oil ratios, further delay will be costly to all concerned.

Most recent reservoir-pressure survey is that for September 1946 when the average was found to be 1,887 psi. (measured for 180 key wells). As the original bottom-hole pressure was 3,130 psi., the decline to date thus is 1,243 psi., or approximately 40 per cent. The March 1946 average pressure was 2,220 psi. (182 key wells), so the decline for only the past 6 months has been 333 lb. On gas-oil ratios, the original value was about 950 cu. ft. per barrel. In February 1946 the average ratio had risen to 2,916, but the August 1946 survey showed an average of 6,509 which represents an increase of 3,593 in the average gas-oil ratio for just the last 6 months.

West Edmond studies have shown that the field, which produces without an adequate natural water drive, originally contained approximately 600 million barrels of oil. Engineers' consensus is that 140 million barrels can be recovered under the present competitive methods of operation. Since approximately 52,500,000 bbl. of oil have been produced up to September 1, 1946, this means that the pool already is slightly more than 37.5 per cent depleted. Premature abandonment of operations will result under continuation of the present rate of depletion. The unitization itself will prolong the economic life of the field by the conservation of reservoir energy and reduction in operating costs. It has been estimated that without unitization approximately 25 per cent of the total wells in the pool will be abandoned by 1952, and that by that time all producing wells will have been placed on the pump. By the end of 1957 all wells will have been abandoned. With unitization, the oil-producing life may be extended to 1959 or longer. With a gas-injection program, the producing life of the field should extend to 1965 or longer. Of course, the daily rate of oil production from the field will eventually decline, no matter what method of operation is employed. However, under unitization, higher efficient production rates can be maintained longer after the start of such work than are possible otherwise.

Increased Oil Recovery

The committee's study reveals that a substantially greater quantity of oil can be recovered if operation of the field is changed to a program which will conserve all possible reservoir energy. The committee stresses that such a program would be possible only if the field is unitized.

Under unitization two complementary methods of operation are possible: (1) Selective production of wells, and (2) pressure maintenance by returning of gas to the reservoir.

Unitization will immediately permit the selective production of wells. This will result in a substantial reduction in the daily gas production, and at the same time the daily oil production from the field will be maintained at its present level or increased. The engineers and geologists believe that by selective production methods an additional 10 million barrels of oil will be recovered. Such would represent an increase of 11.4 per cent above the 87,500,000 bbl. of oil yet to be recovered by present methods of production.

As soon as practical after unitization, the plan calls for installation of facilities for injecting gas to permit observation of the actual performance of several portions of the field with gas injection. The operators may spend about a half million dollars on this test program. If such a program indicates that gas injection will increase recovery from the reservoir, the operators can then determine the future expansion of the gas-injection project.

It is the majority opinion of the engineers and geologists that field-wide gas injection, if it can be controlled satisfactorily, will increase the ultimate recovery of the field to 180 million barrels of oil. This represents an increase of 40 million barrels or 45.7 per cent additional over the present reserves. Some engineers and geologists, however, believe this figure is much too conservative and their estimates are that an ultimate recovery of 220 million barrels (91.4 per cent additional over the present reserves) of oil may be obtained through unitization and gas injection. The above estimate in oil recovery, incidentally, also would reflect an increase of 5 million, or possibly 10 million barrels, in increased oil to the royalty owners.

Increased Revenue from Natural Gas

Unitization will make possible the saving and processing of large quantities of gas now being vented to the air. The operators of the field also are negotiating a contract with the owners of the gasoline plants, the new contract to be effective after the field is unitized. Under the present contract between the operators and the gasoline-plant owners the operators and the royalty owners receive one-eighth of 50 per cent of the gross revenue from gas sales, while under the proposed new contract they would receive one-eighth of 100 per cent of gross revenue from gas sales and in addition will receive a greater portion of the gasoline and other liquids recovered from the produced gas. The economic life of the plants and total gas volumes processed, of course, would be increased very considerably by gas injection.

Here again, it will be noted that under unitization the royalty owners will enjoy a substantial increase in revenue, in this instance from: (1) More favorable contracts with the gasoline plants, (2) increased recovery of gasoline and other products, and (3) more gas sales.

Participation in the Unit

When a field such as West Edmond is developed, each operator and royalty owner receives a fixed percentage of the money which accrues from the sale of oil, gas, and liquefiable products produced from his particular property. When the production of these hydrocarbons becomes no longer profitable, the lease is abandoned. With unitization, every operator and royalty owner receives a fixed percentage of revenue from the entire field. The share which each would receive of the total oil, gas, and liquefiable products will be determined by a formula based upon measurable engineering factors recognized by both the Oklahoma Corporation Commission and the West Edmond operators. By the use of this formula, percentages applicable to each producing well have been computed and the participants in the unitization project will receive this fixed percentage of all production from the unit area until the last well becomes unprofitable to produce. The factors considered in the above-mentioned formula include acreage, thickness of pay section, bottom-hole pressure, gas-oil ratio, and productivity, all weighted so that each lease will receive in revenue the same proportion of future recovery that the lease would receive under present methods of operation. Examples of the possible future of a hypothetical Tract "A" under the three possible methods of operation are presented in the accompanying table.

Need for Unitization

With the 735 wells now being operated by 32 different companies, and the 29,400 acres of the pool divided into 305 leases, such a large diversity of lease and operating interests permits only a highly competitive, non-efficient type of operation. Existing proration rules control production at West Edmond in as equitable a manner as can be devised but they do not consider the efficiency of production that can be achieved by operation of the pool as a single reservoir entity. The committee summarizes the needs for unitization under the following reasons:

1. To permit selective production and the efficient utilization of the native underground energy of the reservoir to the ultimate benefit of operating and royalty interests through the increase of oil production and the conservation of gas.

2. To permit the initiation of a gas-injection program. Independent gas injection, if attempted, would result in movement of oil and gas across lease lines to the disadvantage of those returning gas to the reservoir.

References (The Oil and Gas Journal)

"West Edmond Field Presents Paradox," Charles J. Deegan, The Oil and Gas Journal, September 9, 1944, pp. 44-47.

"Status Report on West Edmond," Kenneth B. Barnes, The Oil and Gas Journal, December 23, 1944, pp. 66-72.

"West Edmond Conditions Show Possibilities of Increasing Recovery by Pressure Maintenance," Kenneth B. Barnes, The Oil and Gas Journal, March 3, 1945, pp. 44-46.

THREE POSSIBLE FUTURES FOR WEST EDMOND—AS ILLUSTRATED BY TRACT "A" (HYPOTHETICAL)

	Present competitive methods	Unitization	Unitization with gas injection
Ultimate production—Total field, bbl.	140,000,000	150,000,000	180,000,000
Total production—Total field, to Sept. 1, 1946, bbl.	52,500,000	52,500,000	52,500,000
Future production—Total field, from Sept. 1, 1946, bbl.	87,500,000	97,500,000	127,500,000
Future production—Tract "A" (160 acres), bbl.	480,000	535,000	699,000
Future Royalty—Tract "A," bbl.	60,000	66,800	87,300
Tract "A's" per cent of field's future production*	0.548	0.548	0.548
Increased future oil royalty—Tract "A," bbl.	.....	6,800	27,300
Value of increased oil royalty at $1.615 per bbl. (tax deducted)	.....	$11,000	$44,000

*The formula for determining the percentage participation of each well is:

$$100\left[\tfrac{1}{2}\,\frac{\text{Daily well allowable}}{\text{Daily field allowable}} + \tfrac{1}{2}\,\frac{\text{Feet} \times \text{bottom-hole pressure of well}}{\text{Sum of (feet} \times \text{weighted bottom-hole pressures)}}\right]$$

Where feet is the thickness of the Bois d'Arc plus the productive thickness of the Lower Hunton.

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Another Price Advance Posted For Entire Range of Heating Oils

PETROLEUM - product prices continued their general upward trend last week with fractionally higher quotations posted in the Mid-Continent area for the entire range of burning oils.

The latest increase was the third ⅛-cent rise in this group of products since the crude-oil price advance last month. Despite continued mild weather in some parts of the country, demand for heating oils was mounting steadily higher.

The bullish trend of the market shared interest with several other developments. Tank - car shippers viewed with misgivings the newly announced freight-rate increase which will boost tariffs through most of the northern marketing territory 0.4 cent per gallon and better the competitive position of the pipe lines.

The sudden end of the coal strike was reported to have halted some speculative buying of heavy fuel oil. Prices as high as $1.60 per barrel were said to have been offered before it was announced the miners would return to work. Demand for heavy fuel oil was reflected in an increase in the market posting from $1.31-$1.39 to $1.35-$1.39 per barrel.

Return to a normal coal supply ended some temporary arrangements of industrial plants for emergency oil use, but the general trend of coal-to-oil conversions was expected to continue. Indicative of the situation was a report of the New York City department of housing and buildings that approved applications for the installation of oil-heating equipment more than tripled in the first 10 months of 1946.

In New York, a plentiful supply of No. 2 fuel oil and kerosene was reported. Kerosene prices were up generally 0.3 cent per gallon in New York harbor and terminals in New York and New England. Residual fuel oil prices were holding at existing levels.

Of all petroleum products in heavy demand, some suppliers considered lubricating oils still to be in the tightest market position. Export demand was coupled with greater domestic requirements due to the generally high level of industrial activity and the apparently heavier consumption of oil by the older, well-worn vehicles now on the highways. Refiners were quoting 16-17 cents for 200 vis. No. 3 neutral and 24½-29 cents for 150-160 vis. D, 10-25 p.p., bright stock.

Statistical data for the week ended November 30 gave further evidence of the buoyant market. Stocks of residual fuel oil and gas oil-distillate showed declines of 1,418,000 bbl. and 481,000 bbl., respectively. Daily gasoline demand, holding above the 2,000,000-bbl. mark was figured at 2,074,000 bbl. during the week against 1,909,000 bbl. in the corresponding 1945 period.

The latest advances in heating-oil prices in the Mid-Continent area placed quotations for 42-44 kerosene at 5¾ to 5⅞ cents; No. 2 fuel oil, 4⅞ to 5 cents; and range oil, 5¼ to 5½ cents. Gasoline prices generally were unchanged with spot - market materials moving at about 6¾ cents.

Pennsylvania Crude Price Hiked 14 Cents

A 14-cent increase in the posted price for Pennsylvania-grade crude oil, effective December 1, was announced last week by several purchasing concerns. The price hike will mean no added income to producers, however, since the increase will be deducted from the federal Government subsidy.

The subsidy has been 44 cents per barrel in the Bradford district and 50 cents in the Lower district. With a subsidy cut equal to the price advance, the subsidy will be 30 cents in the Bradford district and 36 cents in the Lower district.

The increase applied to all districts but not to Corning crude which was hiked 10 cents a barrel November 16.

First move in the new postings was made by the Joseph Seep Purchasing Agency of South Penn Oil Co. Other concerns announcing the new postings include: Pennzoil Co., Quaker State Oil Refining Corp., Cities Service Co., Valvoline Oil Co., United Refining Co., and Elk Refining Co.

Crude Postings Modified

Pan American Production Co. of Houston, subsidiary of Standard Oil Co. (Ind.) has corrected its crude-price schedule to increase by 10 cents the price for crude from Willamar field of Willacy County, Texas, making it $1.55 a barrel. Placid Oil Co. and Arkansas Fuel Co. increased Tulos and Urania crudes in northern Louisiana 4 cents a barrel to $1.84 to make the price comparable to that in nearby fields.

Tanker Sale Approved

WASHINGTON.—Sale of two war-built, T2 tankers to Oriental Trade & Transport Co., Ltd., Toronto, Ont., has been approved by the United States Maritime Commission.

DEATHS

Ben F. Johnson, 66, former oil operator and lease broker in San Antonio, died December 3 in Tulsa. He also had been active in the cattle and banking business in Oklahoma.

Rufus Burleigh Hickman, 51, former engineer with Standard Oil Co. of Kansas, died November 30 at his home in Legion, Tex.

John J. Allinson, 63, former vice president of Lion Oil & Refining Co. and Waters Pierce Oil Co. and former chief resident engineer for the Oak Ridge atomic bomb project, died December 2 in a Houston hospital. Immediately prior to his death he was serving as president and executive engineer of J. J. Allison & Sons, construction company.

Dudley H. Snyder, 71, oil operator and cattleman, died December 2 in a hospital in Fort Worth.

John J. Connors, 67, veteran of 27 years in the production department of The Texas Co., died December 4 at his home in Tulsa.

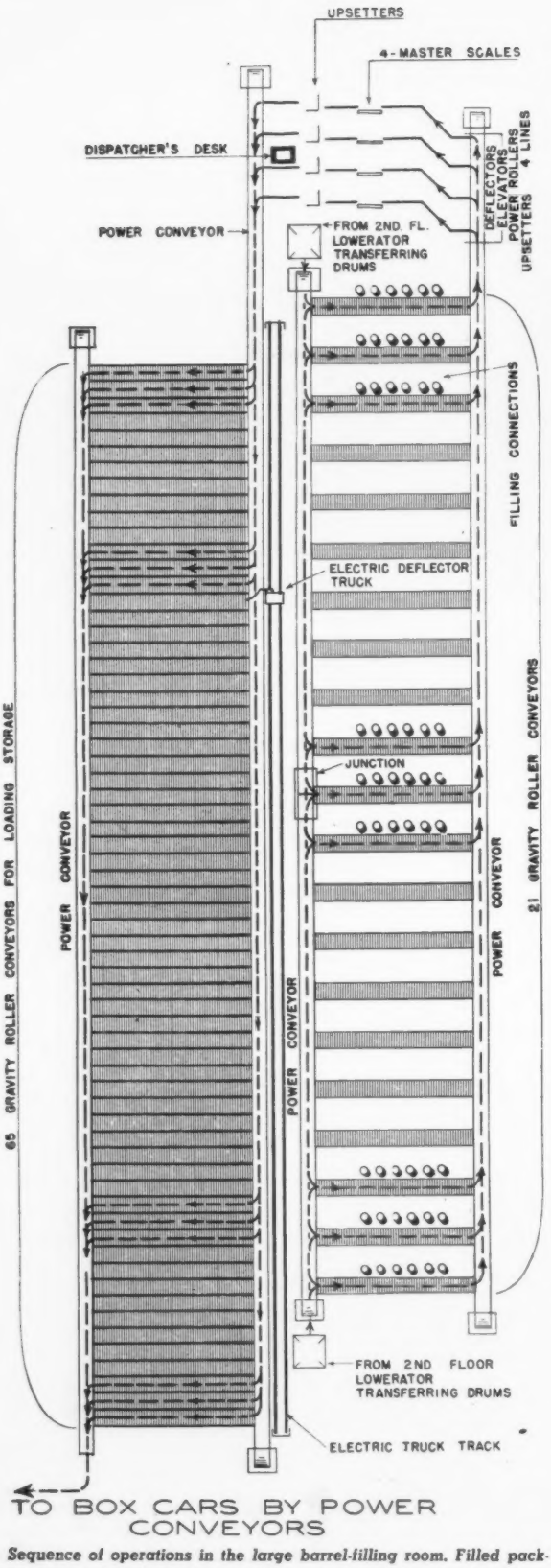
Ira D. Brooks, 65, oil-field construction contractor until his retirement in 1939, died December 2 at his home in Tulsa.

Charles E. Hane, 67, Tulsa oil operator and former vice president and treasurer of Tidal Oil Co., now Tide Water Associated Oil Co., died December 6 at his home in Tulsa. Hane retired in 1925 after serving nearly 20 years with the oil concern and since that time had operated independently.

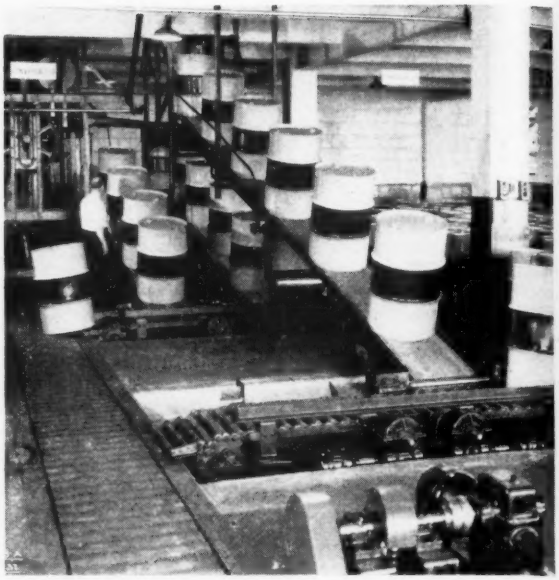
Alexander Lucius Dade, Jr., 49, vice president of Deep Rock Oil Corp., died December 8 in Kansas City. He was en route from his home in Tulsa to New York to attend a board meeting.

Arthur R. Johnston, prominent among Canadian drillers in foreign fields, died recently in Adelaide, Australia. Born in Petrolia, Ont., 76 years ago, he went to Australia at the age of 19 to assist his father in drilling for the Australian Government.

Thomas M. O'Connor, Sr., owner of extensive oil holdings in South Texas, died December 5 at his home in Victoria.



Sequence of operations in the large barrel-filling room. Filled packages move directly to box cars. Shown is part of the 3½-mile system of conveyors in the compound and cooperage building of The Texas Co. at Port Arthur



Retarding conveyor handling drums from paint-drying ovens. All steps are synchronized with great accuracy for maximum accuracy

Streamlined

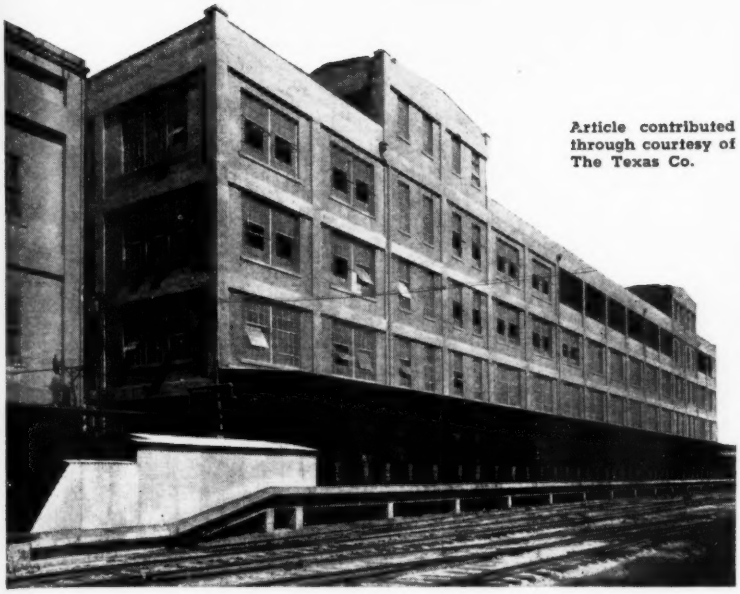
ONE of the reasons why Port Arthur, Tex., boasts that "We Oil the World" is that of the huge four-story compound and cooperage building at The Texas Co.'s refinery there. In that plant building all activities of the company associated with drumming and packaging oil products are carried out, and large quantities of finished products move into domestic and foreign trade channels. In 17 years millions of packages have been handled.

The main works in the C. and C. building, as it is called, and which extends into the adjacent barrel house, is 400 ft. long by 150 ft. wide with barrel house being 250 by 150 ft. The main building is four stories, the barrel house three stories. Nearby is a tank farm containing 125 tanks of 1,500 to 6,000-bbl. capacity each, for storing finished lubricating oils. From these buildings and tanks 475 different grades of lubricating oils, more than 100 grades of greases, a wide assortment of waxes, and huge amounts of refined oils are tested, packaged, and loaded for shipment. All these steps must be synchronized with great accuracy and coordinated with all other activities to avoid bottlenecks and to maintain maximum efficiency throughout the highly involved system. The piping manifold handling these products is one of the largest in the industry, and the system is served by 29 pumps.

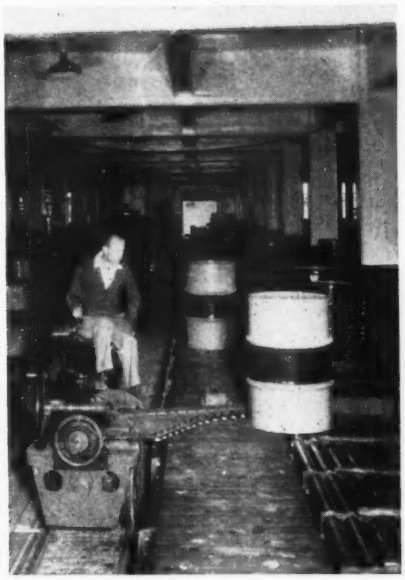
Conveyor System 3½ Miles Long

The buildings in this operation house 3½ miles of conveyor system, which handles all empty and filled containers of every sort used by the unit. In a special tank room a total of 161 tanks are installed; these are 15 to 30 ft. high and have capacities ranging from 2,500 to 12,000 gal. All are fitted with the necessary lines. Products are pumped into these tanks, and drums and smaller packages are filled from them by a simple gravity flow, through accurate meters or weighing devices.

Among the noteworthy features of the system may



Article contributed through courtesy of The Texas Co.

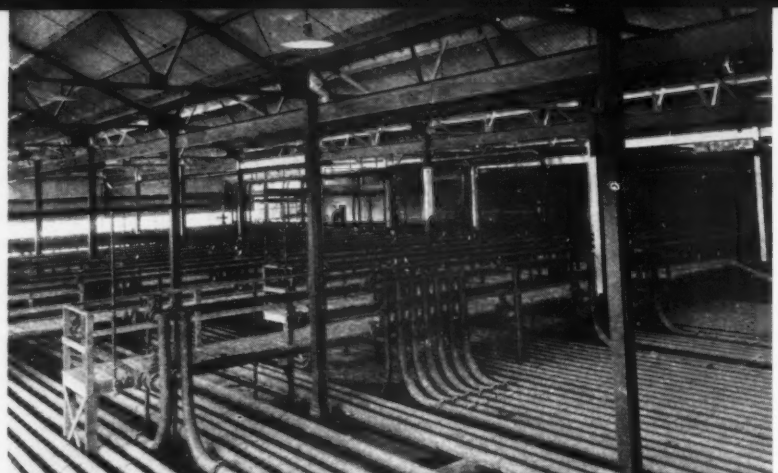


Left: Front view of C. and C. building showing conveyor on platform for transferring empty packages from cars to storage. Right: Filled packages being deflected by electric deflector truck. Leaky drum in rear is being delivered to dump rack

Flow Speeds Output of Lubricants

be mentioned the service which inspects, checks, samples, and tests finished products to insure compliance with specifications, and the rapid-fire paint department with its package-handling machines and its 30-minute drying ovens which process and turn out the labeled containers. The conveying system is equipped with an elaborate assembly of elevators, lowerators, twisters, and similar equipment which handle the various containers from storage to finished-filled outgoing products, with a quart can requiring only 1 hour to complete its cycle. By a special silk-screening process the stencil department applies the trade mark in an artistic manner to packages

Left: Loading box cars. Packages are transferred from loading storage by power conveyor. Right: Machine which double decks in box cars



View of part of lubricating-oil manifold of compounding plant

containing premium products. In the loading department packages are grouped by grades for an entire schedule and not by single or individual orders, a method which saves considerable time. A handling machine double decks drums in box cars for shipment.

Continuous Operation

Operating on a 24-hour day, 7-day week, the compounding department uses 10 large mixing kettles of about 1,000-bbl. capacity. A total of 54 pumps, each capable of handling 300 bbl. of liquid per hour, serve the needs of this department. Tankage capacity totals about 400,000 bbl. Finished, straightrun lubricating oils are received from the manufacturing department of the Port Arthur refinery and stored for use in compounding the many different grades of oils. These oils are blended in varying proportions to make the finished commercial grades. Each time an oil is blended or is transferred to another tank or container it is again tested to be certain no contamination has occurred. After use of a given pump and line for a given product, they are blown clear to remove the residual oil and prevent contamination of the next batch. When starting the packaging of any product the first containers are sampled and tested to guard against contamination.

Many other products reach the conveyors of the dispatching and loading department, coming direct from the refinery or the grease plant, which is located alongside the compounding building. More than 100 grades of greases are produced and forwarded from one of the largest of the world's grease plants. Numerous grades of paraffin wax, extracted from (generally) lubricating-oil fractions, are placed in slabs, bags, barrels, and cases for delivery. All work of the compounding department is carried on by 29 men, operating on three 8-hour shifts per day.

Unloading Department

All new and used containers arrive at the unloading dock via box car and truck (new units come from the factory and used containers are returned to the plant from dealers). This department unloads, checks, and stores these packages for later delivery to the packaging units, including 15, 30, and 55-gal. metal drums, 400-lb. grease drums, steel barrels, and 100-lb. "cartridges." All are placed on power elevators and conveyors and passed to the painting room on the third floor where most are painted, with new containers, or repainted in the case of used ones. Next step is to storage, for call by the packing department. The 100-lb. grease drums are purchased already lithographed and are sent directly to the stencil department for marking with the name of the grade of oil.

All cases and cans are manufactured by the company's own case and package division, located 4 miles from the refinery and the compounding building on a branch of the Kansas City Southern railroad. Transferred by rail to the barrel house alongside the compounding building, these containers are stored on the second and third floors, according to size and style. Carload lots include 1,200 to 3,000 packages, depending on the size of each container. Motor-oil cans of 1-qt. capacity are received via boxcar load and sent directly to motor-oil filling units in the compounding building. Other types of freight such as paints and materials bought outside the company are unloaded and delivered to the proper department in the compounding building. In the

Package-preparation room. Inspector in foreground is using a special light to examine a drum interior

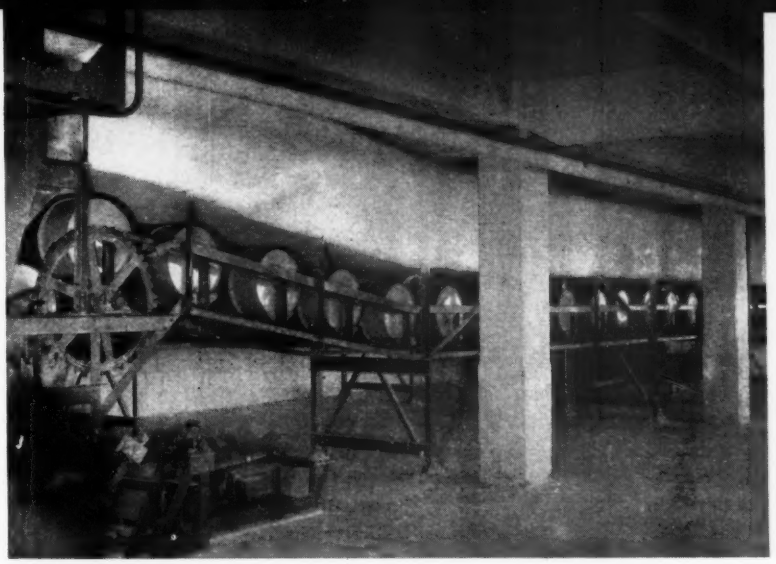
unloading department 80 to 90 laborers are employed 5 days per week, three shifts per day.

Reconditioning Containers

The drum reconditioning department employs 55 to 60 men who work a two-shift, 5-day week. On the fourth floor of the compounding building all drums, barrels, and cartridges are washed, cleaned, and put into first-class usable condition before being stored for use. Employe training and an efficient system make for thoroughness of the work and care in guarding the purity of products. Packages are received via drum elevators. Bungs and gaskets are removed, the bungs being washed, and new gaskets installed. The drums are inverted over 1-in. jets and steamed for 5 minutes, rinsed with hot water for 2 minutes, and revolved in a vat of caustic solution for 1 minute. These operations clean the drum effectively, inside and out. The caustic which enters the drum through the bung opening is drained back into the vat from the inverted drum. Next the drum is sprayed with clean water outside while revolving, and is inverted over a hot-water jet which removes all caustic from the inside. Then all water is removed and the drum dried with a 220° F. air jet for about 25 minutes, completing the cleaning cycle.

An inspector at this point goes over the drum carefully, classifies it as suitable for pale oil, red oil, or black oil; if the outside surface is rusty the drum is sent to the sand-blasting and wire-brushing units for cleaning the exterior. When this work is completed the drum is lowered to the painting booths on the next floor below.

The paint-department equipment is planned so that conveyors, machines, ovens, and other units in the system are streamlined. Many widely known color combinations are handled, such as the gray, green-banded drums; drums with white heads; blue bodies



One unit of the paint-drying ovens with barrels emerging into cooling space

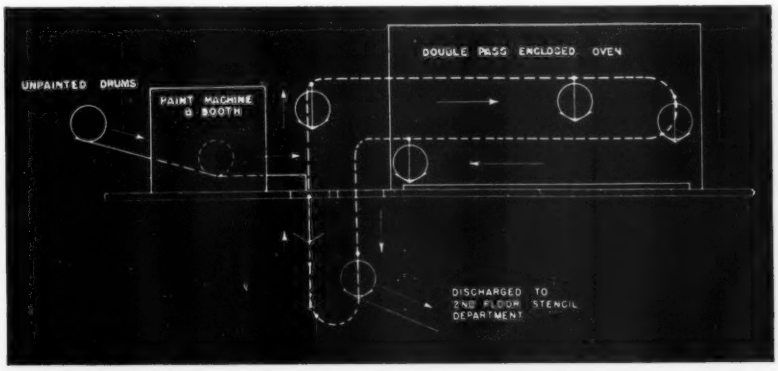
banded with white, and many other devices. In carrying out these operations, the paints are pumped to 30-gal. pressure pots connected with the spray guns. In the painting booths two men operate three guns while the drum revoves in a horizontal position. One paint operator covers the head and adjacent sides down to the rolling hoop with gray; the other operates two guns, one to cover the other head and side up to the hoop with gray, the other to put green between the hoops. When completed, the drum is ejected by the one-gun operator and another drum feeds into position. The drum is dried, while passing in a horizontal position through a double-pass oven, for 30 minutes at 190°-210° F. It is then transferred to the stencil department, with upsetters and conveyors placing it in an upright position en route.

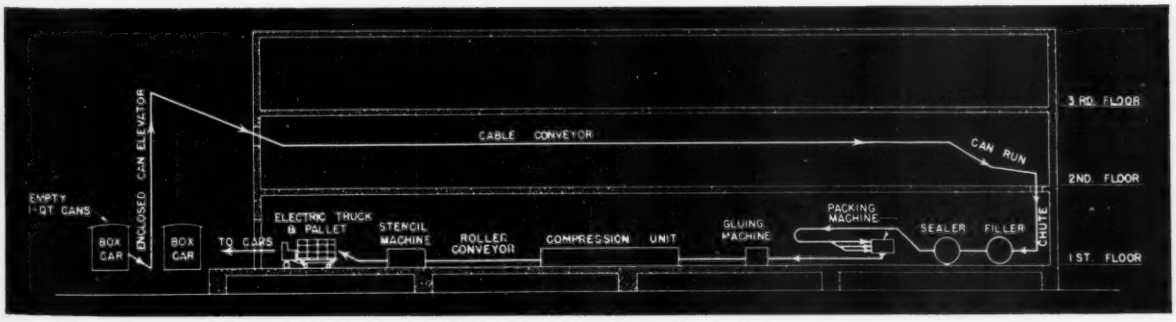
Three paint machines handle 900 packages per hour. They are equipped with vents which are inspected weekly and cleaned, and with handling equipment which is inspected and cleaned daily. Ten men operate this department, three shifts, 5 days per week. In general practice, the paint department manages to maintain a stock margin of 700 - 800 packages ahead of the stencilers.

The Stencil Department

The stencil department operates with 40 to 50 men on three-shift, 5-day-week schedules. The company

(Continued on page 100)





Right: Outline of a unit of the drum paint-drying oven from which packages emerge bright and dry in a half hour. Below: Flow line of the 1-hour cycle of 1-qt. motor-oil cans arriving empty, being filled, cased, and moved to loading platform

Mechanically Rotated Scraper Blades

Eliminate Paraffin Accumulation

in tubing of any pumping well

by Burns Kingston*

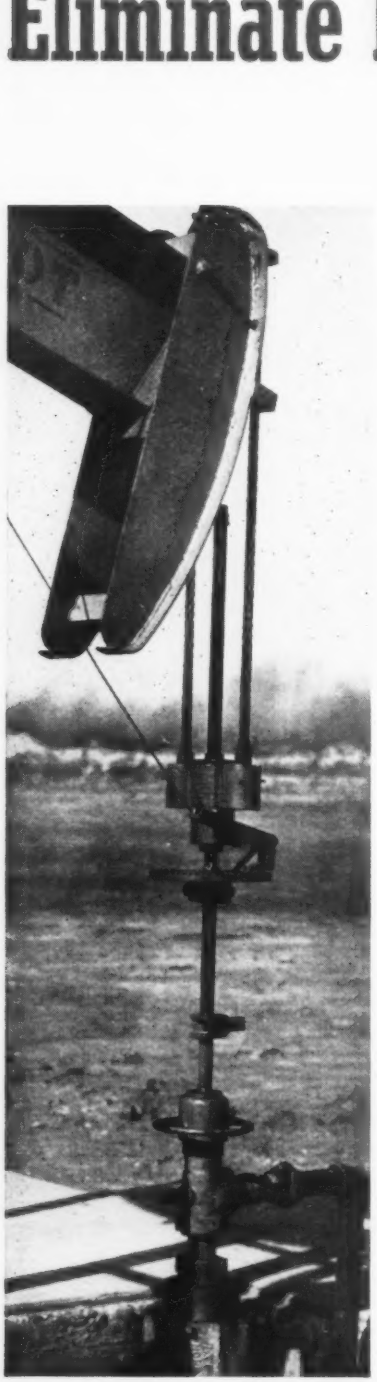
A NEW and practical mechanical method of eliminating paraffin accumulation in the tubing of any pumping well has brought an enthusiastic response from operators contending with that troublesome problem. This equipment, tested by more than 30 different major and independent companies operating in every troublesome paraffin field in the Mid-Continent area has been developed by J. M. Huber Corp. The companies have found that this patented process has proved its ability to eliminate an old and expensive production difficulty.

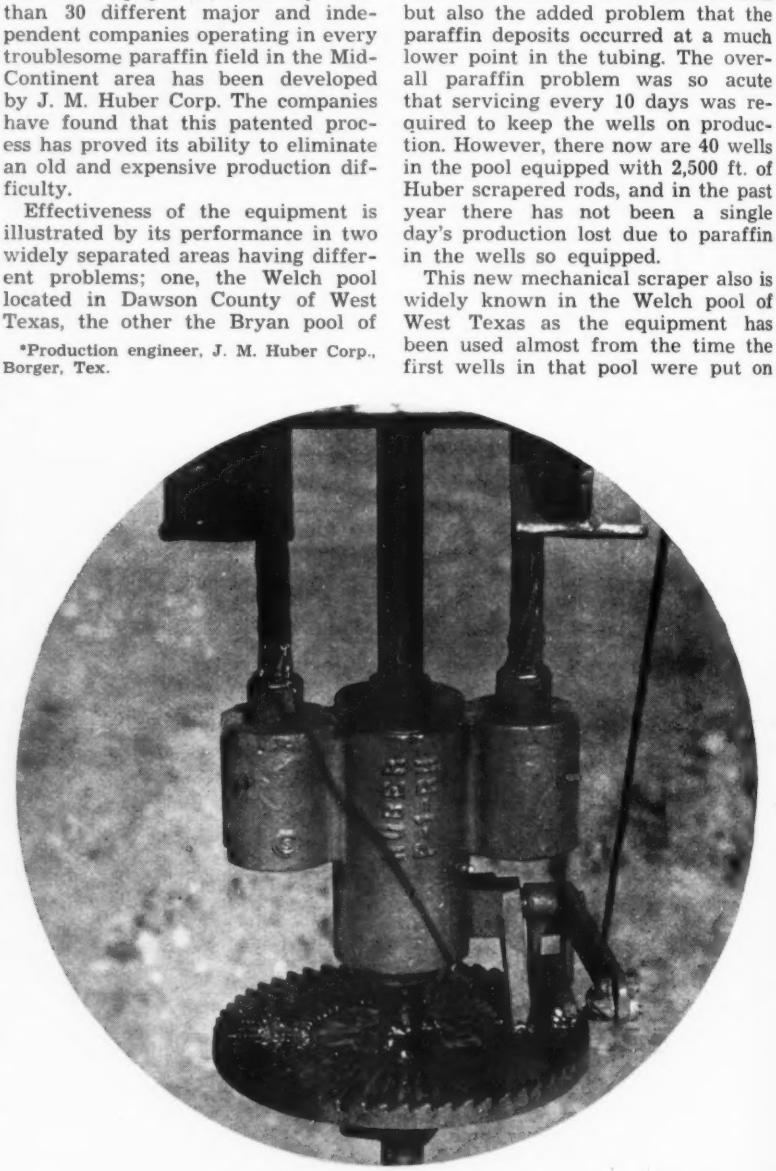
Effectiveness of the equipment is illustrated by its performance in two widely separated areas having different problems; one, the Welch pool located in Dawson County of West Texas, the other the Bryan pool of north Hutchinson County in the Texas Panhandle.

Shortly after development of the Bryan pool began, it was found that the wells presented not only the usual severe paraffin-accumulation characteristic of the whole Panhandle area but also the added problem that the paraffin deposits occurred at a much lower point in the tubing. The overall paraffin problem was so acute that servicing every 10 days was required to keep the wells on production. However, there now are 40 wells in the pool equipped with 2,500 ft. of Huber scrapered rods, and in the past year there has not been a single day's production lost due to paraffin in the wells so equipped.

This new mechanical scraper also is widely known in the Welch pool of West Texas as the equipment has been used almost from the time the first wells in that pool were put on

*Production engineer, J. M. Huber Corp., Borger, Tex.





Above: The sucker-rod string of this well is rotated on each pumping stroke. Paraffin-scraper blades are attached to the sucker-rods. Flexible cord to the walking beam pulls the actuating lever. Right: Closeup view of the gear table and lever mechanism which make up the rotary polished-rod hanger

production. Here the condition was not as severe as in the Bryan pool. Formerly, however, those wells producing their allowable went off production in approximately 27 days due to paraffin accumulation and required one or more of the conventional paraffin-servicing methods every 3 weeks in order to maintain their production schedule. Severe deposition was found at 800 ft., and 1,000-ft. strings of scrapers were run by several of the producers in the area. Over 60 per cent of the wells in the field were so equipped and in them paraffin since has ceased to be a production problem.

Scraper-Equipped Rods Are Revolved

Working principle of the device is based on the fact that as long as the rod string equipped with the scrapers is revolved as it is reciprocated, wiping motion of the scrapers against the tubing wall will prevent paraffin accumulation.

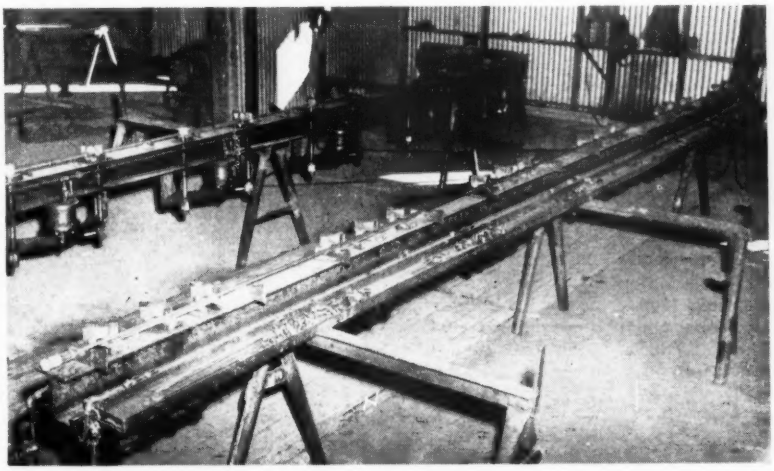
The scraper blades are made of flat ⅛ in. soft mild steel 1½ in. in width and 2 ft. long, spaced 26 in. apart longitudinal to the rod. The sucker rod is placed in a pneumatic jig which is equipped with pressure arms designed to force three U-shaped clips around the rod and to within 1/32 in. of the surface of the scraper. These clips are placed one at each end and one in the center of the scraper. Welds are then made uniting the ends of the clips to the scraper, thus effecting a strong friction grip of the scraper to the rod without impairing in any way the quality or tensile properties of the material in the rod.

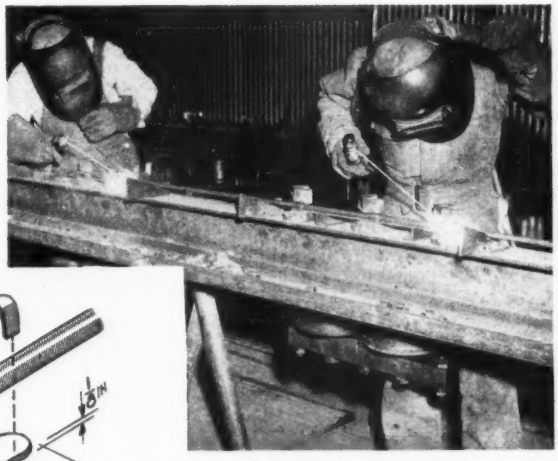
The rotary polished-rod hanger employed to rotate the rod string and thus complete the function of the equipment is simple in construction and operation. A hanger body of high-grade cast steel is attached in the conventional manner to the bridle of the unit's or jack's head. The polished rod on installation is passed through the hanger and held in place at any selected point by self-equalizing slips and slip holder. The latter in turn rides free of the head on a heavy duty horizontal thrust bearing. Aligning of the polished rod and lubrication of the bearing are maintained by seals in both the top and bottom of the hanger. Construction of the hanger unit has a safety factor of at least eight to one under the most severe pumping conditions.

Rotation of Rod String

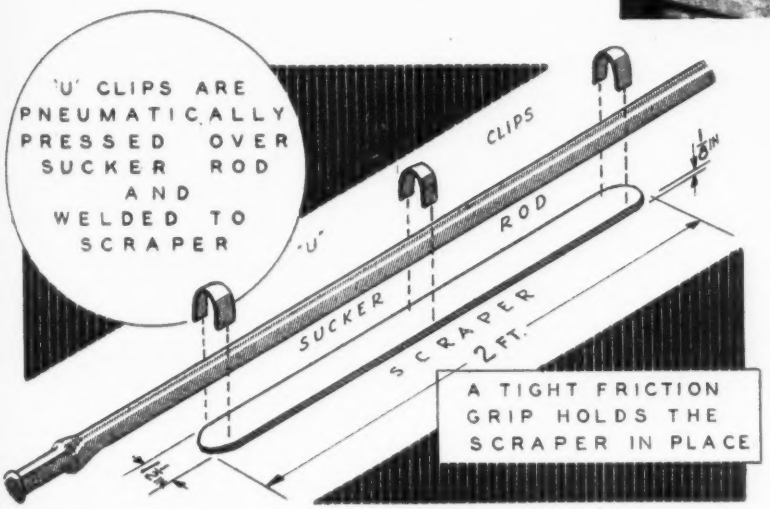
Rotation of the rod string is accomplished by ratchet levers attached to the lower part of the hanger body engaging teeth on a horizontal toothed table flanged directly under the hanger. The actuating lever employed to engage the teeth on the table on each reciprocation of the pump is kept in motion by means of a flexible cord attached to the arm of the lever, and running to the beam of the unit. Action of the lever is controlled by changing the position of the flexible cord along the beam. The partial rotation of the scrapered rod string on each reciprocation of the pump prevents the accumulation of paraffin.

Application of the scrapers is as simple as their construction. Each individual well is first checked before installation of the scrapers to determine the point at which the troublesome paraffin accumulation is encountered. As experience has indicated that the deposition will slowly work down the tubing, scrapered rods are run to at least 200 ft. below the point where the deposits originally accumulate. Five hundred of these installations are now in use.





Above: These are pneumatic jig units which push the U-clips firmly onto the sucker rods. Right: The 1½ by 24-in. scraper blades are welded to the U-clips. Below — Details of scraper-blade-sucker-rod assembly



New Cat Cracker Incorporates War-Developed Improvements

LATEST of The Texas Co.'s fluid catalytic cracking units was brought on stream on January 9, 1946, at Lockport, Ill. This unit was designed and constructed by M. W. Kellogg Co. and was intended to supplement existing facilities to increase the wartime manufacture of aviation gasoline.

Design of the unit incorporated those improvements and alterations which wartime operating experience had indicated to be desirable. The layout and design of the cracking section proper, while differing in detail from preceding units constructed during the war, closely followed the general pattern of the more recent construction. The reactor, a 27-ft. i.d. by 38-ft. 10-in. vessel, was installed with a 10-ft. i.d. by 13-ft. unpacked spent-catalyst stripping section. One reactor feed line was provided which terminated in a conventional feed-distributing cone and grid. A conventional system of Buell cyclones was built into this vessel. The regenerator, a 42-ft. 6-in. i.d. by 28-ft. 10-in. vessel, was installed with the grid at an elevation of 108 ft. above grade, with cyclones provided for the recovery of catalyst fines from the flue gases leaving the vessel.

A Cottrell precipitator was added for the final recovery of catalyst from the flue gases leaving the unit, and dust pumps and conventional slide valves and an air-conveying system were installed for returning the catalyst fines to the regenerator. An A-frame preheater with a design-capacity heat liberation of 47,000,000 B.t.u.'s per hour and a 60,000,000-B.t.u.-per-hour design duty recycle catalyst cooler were provided for control of the unit heat balance and to permit a wide flexibility in operations.

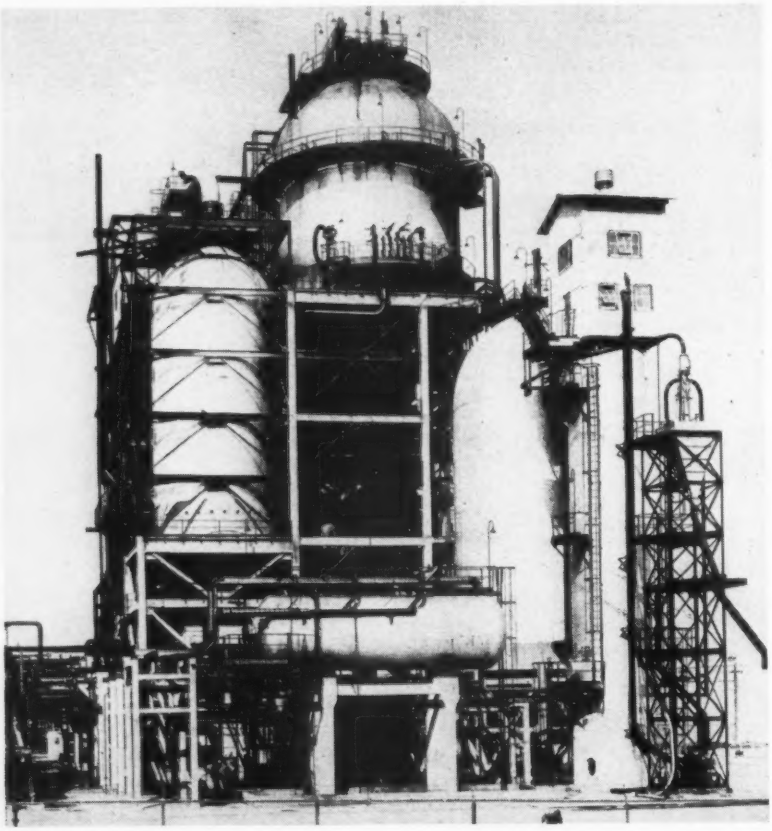
The fractionating tower is an 18-ft.-diameter vessel equipped with two side-stream strippers for gas-oil manufacture and with conventional slurry fresh-feed heat exchangers and waste-heat boiler. The recovery of catalyst carried over from the reactor to the fractionator is effected by decantation of the fractionator bottoms in an 18-ft.-diameter Dorr settler, the concentrated slurry removed from the bottom of the settler being returned to the reactor feed line. The products of cracking boiling below 400° F., removed overhead from the fractionator, are subsequently separated into a propane-and-lighter fraction, a butane fraction, a pentane fraction, and finally a light and heavy naphtha.

Gas removed from reflux accumulator drum of the unit fractionator is compressed in a conventional two-stage gas-compression system, the uncondensed material entering a 28-tray absorber. Lean oil for the absorber is withdrawn from the fractionator and the rich oil is returned to the fractionator at a higher entry point. A cascade system of towers was installed for the subsequent depropanizing, debutanizing, depentanizing, and rerunning of the catalytic naphtha, the operations being conducted in that order.

Initial loading of catalyst to the unit was completed on January 9 and catalyst circulation was started at that time. The initial batch of catalyst consisted of spent catalyst from the Port Arthur and Los Angeles units, with fresh catalyst subsequently added to maintain catalyst activity as desired. Charge for the catalytic unit consisted of a mixture of gas oils obtained from processing crudes from Kansas, Oklahoma, and Texas. Typical tests on the catalytic-unit charge stock, together with present operating conditions follow:

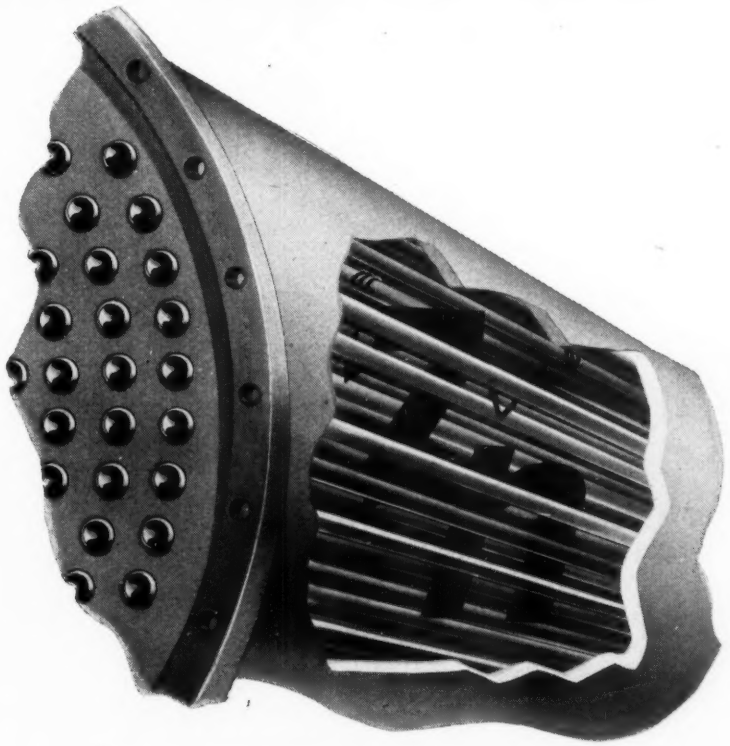
Charge stock quality:	
Gravity, °A.P.I.	34.3
50 per cent point, °F.	566
Unit operating conditions:	
Fresh charge rate, B.p.o.d.	19,313
Recycle charge	8,139
Space velocity, W/hr./W (basis total reactor throughput)	.610
Catalyst to oil ratio (basis total reactor throughput)	8.1
Reactor temperature, °F.	875
Regenerator temperature, °F.	1,065
Catalyst activity, sq.m./Gm.	74
Yields—volume per cent:	
Conversion—gas oil disappearance	58.10
Dry gas	5.63
Total C_5-400° e.p. naphtha	48.26
Cycle gas oil	41.90
Coke and loss	4.21
Product quality (depentanized gaso.):	
Research oct., clear	89.0
A.S.T.M. 50 per cent, °F.	272
Gravity, °A.P.I.	49.9
R.v.p.	2.5
E.p., °F.	392

Since the startup of the unit, operations have been directed toward maximum recovery of a high-quality motor-gasoline base stock, and these operations have been free of mechanical difficulties to the extent that the unit is expected to continue to operate for approximately 1 year, at which time it will be voluntarily shut down for a mechanical inspection.



Texas Co.'s million-dollar fluid cat-cracking plant at Lockport, Ill.

Zinc's in to stay!



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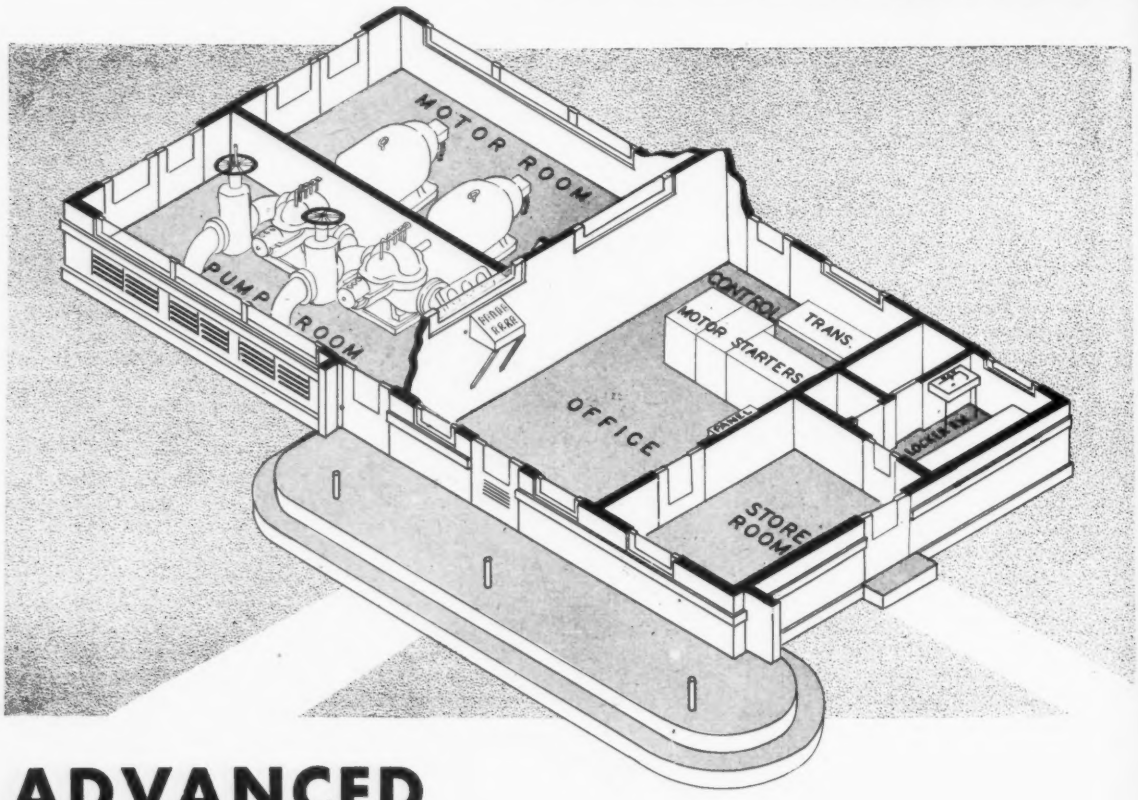
Right: Modern architectural application of brick and tile construction to the design of the Englewood station building.

Below: Isometric diagram showing the relation of the control room office to the pump and motor rooms and other facilities



ADVANCED

Design Features

OF NEW PUMP STATION

by Paul Reed

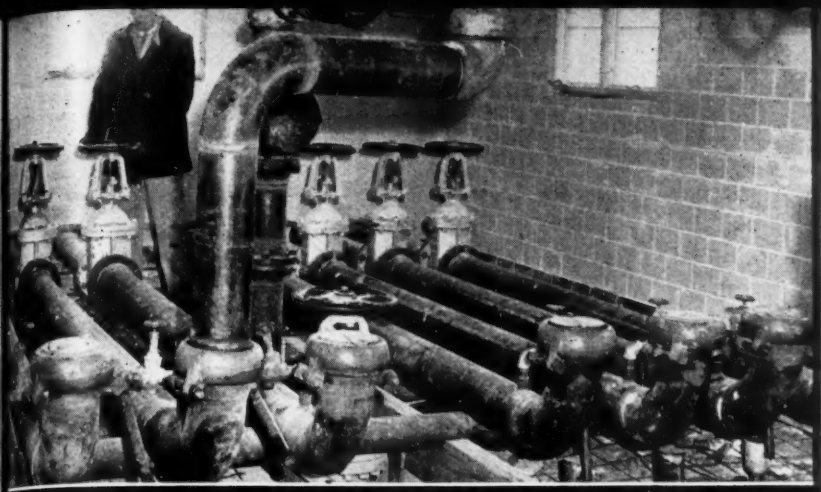
AN advanced type of electric-centrifugal crude-oil pump station has been developed by Texas-New Mexico Pipe Line Co. The station design is notable because of several features which represent forward steps in modern pipe-line practice. These include measures that are innovations in crude-oil pipe-line stations which have been applied on certain refined-products lines during the war years.

This type of station may possibly be leading in a direction which will establish a trend in future station design. While the Englewood station performs the special function of supplying refineries with crude from terminal storage at a rate higher than would be normally possible with the main pipe line, the basic principles are applicable to many main-line electric-centrifugal pump stations. This station has a capacity for delivering 90,000 bbl. daily at relatively low head through 8 and 9-mile sections of 12-in. lines to The Texas Co. and Sinclair Refining Co. refineries in the Houston Ship Channel area.

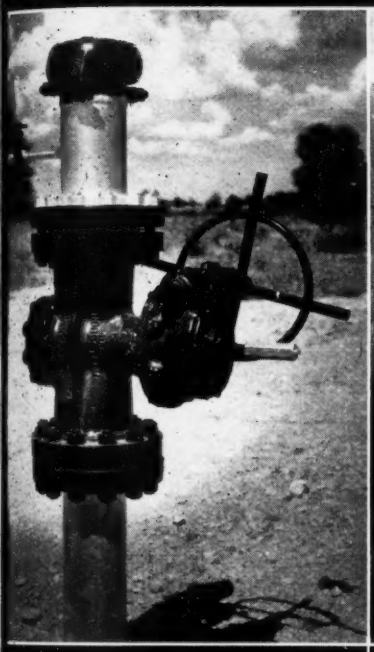
The station building itself is a distinguished example of modern architecture, designed for operating convenience, utility, and pleasing appearance and safety. A recent trend at the terminal is exemplified in the installation of 16-in. suction lines connecting each of the ten 55,000-bbl. tanks served by five vertical suction pumps. An innovation at one of the tanks is an experimental agitator unit.

The entire layout at the station and terminal is not only attractive but it has been effectively planned for efficiency, safe operation, and good working conditions.

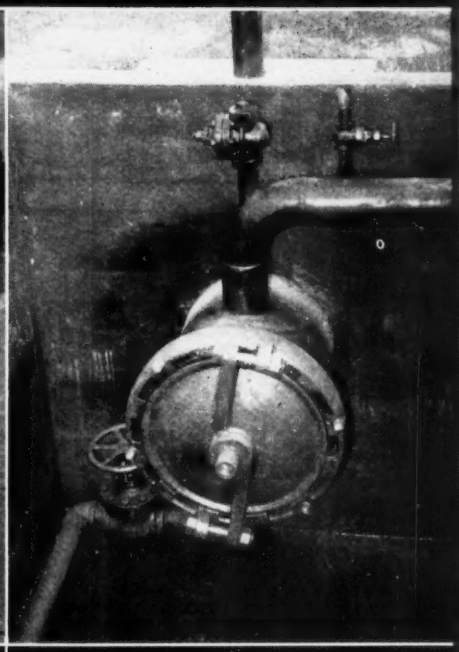
Information for this article was procured through arrangements made by B. E. Hull, president; R. B. McLaughlin, vice president, and L. F. Scherer,



PRODUCTS LINE TERMINAL FITTINGS



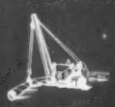
GAS LINE BLOWDOWN



24" SCRAPER TRAP

OIL LINE SCRAPER TRAP

4 WAYS TO MAKE UNIBOLT *pay off* to PIPELINERS



Several particularly advantageous applications of UNIBOLT Pipeline Couplings are illustrated at left. These unique couplings effect a leak-proof seal under all conditions by simply tightening a single bolt (2 bolts on 6" and larger sizes) thus applying sealing compression to a renewable resilient ring gasket. A blanking plug readily interchanges with the plain hub of the coupling to provide a dead-end for the line. Obviously, assembling and dismantling is quick and easy as compared with either a threaded or multi-bolt flanged closure, to say nothing of the more efficient sealing principle.

Complete details are carried in the new Thornhill-Craver Company Catalog No. D-46, a copy of which will gladly be sent on request.

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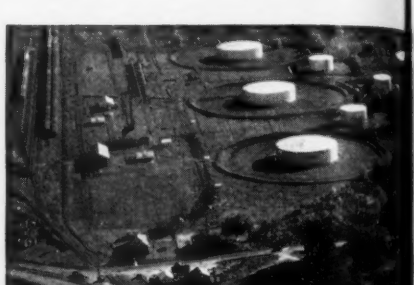

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chief engineer, under whose supervision the station and terminal were designed by the engineering staff serving Texas-New Mexico Pipe Line Co.

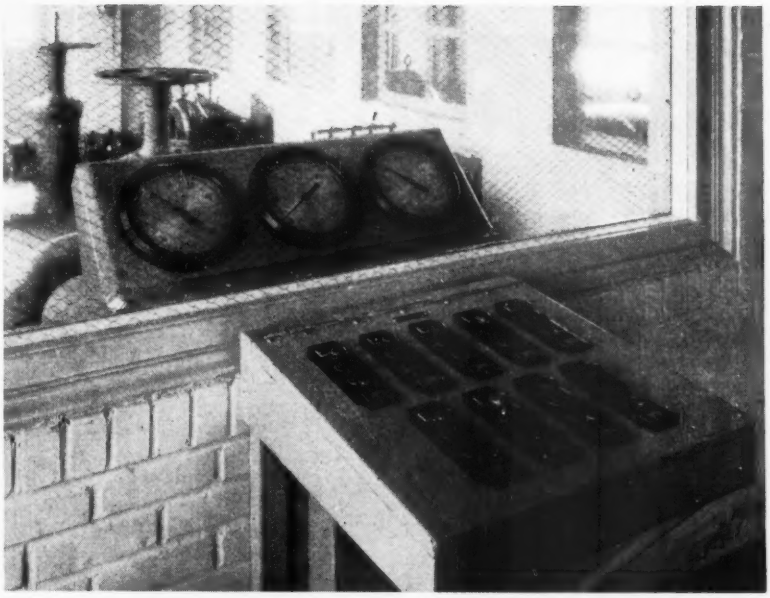
Construction of Station Building

Central feature of the Englewood pump station building is the combination office and control room from which the operator has a clear view of the pump and motor rooms through a double gas-tight clear-glass window. The pump and motor rooms are separated by a fire wall, the drive shafts being sealed with steel-panel stuffing boxes fitted in the wall. To insure against danger of gas penetration, the air pressure within the office-control room is supplied by a blower and pressure is controlled by the adjustment of door louvers so that it may be maintained at an equivalent of 2 in. of water. Electric strip heaters located in ventilating fan ducts warm the office-control room.

The pump station itself is built of brick and tile of modern architectural design, and has a flat insulated roof. The exterior and interior of the building are thoroughly illuminated. Fluorescent lighting serves the office-control room. Explosion-proof incandescent fixtures are installed in the pump and motor rooms. Fresh air is circulated through both pump and motor room by evacuator fans mounted on the roof. The air enters through screened louvers under the pump and motor-room windows.

All valves except the pump-discharge valves are located outside the station building as are all facilities such as water well, motor-driven sump pump, etc.

The station has two high-speed pumps designed for high volume at relatively low head; these are manifolded to operate either independently, developing 175 psi., or in series, 350 psi. discharge pressure. Pumps are single-stage, 8-in. double-suction centrifugals, each direct connected to a 350-hp., 3-phase, 2,200-volt, 3,600-r.p.m. squirrel-cage motor. Motors driving tank-farm suction pumps operate at 440 volts. Small motors are supplied by current through 2,300/120-240-volt transformers.



Bench-type control board at office window looking into pump room, where gages are placed in a slanting position for convenience and safety

Incoming power, supplied by Houston Lighting & Power Co. at 12,000 volts, is delivered through a 3-phase, 1,500 kva., 12,000/2,300-volt transformer. Provision is made at the transformer installation for disconnecting the 2,300-volt overhead line to the tank farm.

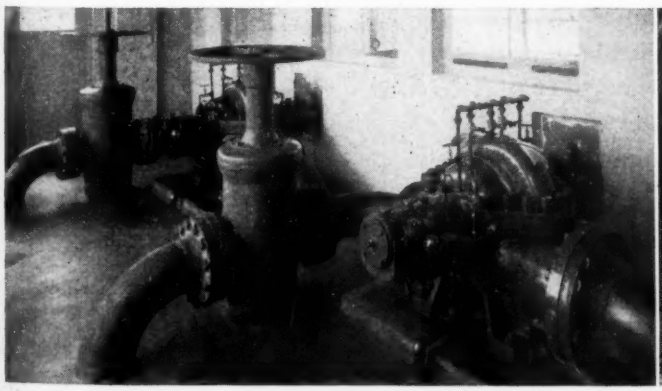
Control equipment and instrumentation are largely centered to be convenient for the operator's functions in the control room where he has an unobstructed view of equipment in both motor and pump rooms.

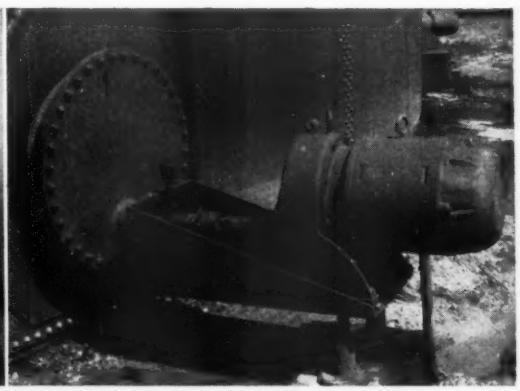
An incoming line panel with breaker and reduced voltage starter for each pump unit, each mounted in sectional panels with dead front, comprise the control equipment. In the control room, the two main pumping units are operated by push-button start-and-stop controls at the control panel and on the control desk. An emergency shutoff is adjacent to each pump. At a bench-type control board installed in the control room the operation of the two main units and the five auxiliary suction units is centralized.

Just outside the window looking from the office to the pump room, gages are placed in a slanting position where they can be easily seen by the operator. This position of the gages is advantageous for the safety of the office-control room. Gages consist of three pressure-indicating gages and one two-pen suction and discharge pressure recorder. Instrumentation includes an indicating volt meter, watt-hour meter on the incoming line panel together with ammeter on each motor control panel.

Comparatively new to crude-oil pipe lining is the use of vertical centrifugal in-the-line pumps such as the five units installed on the ten 16-in.

Left: Ample space is provided for pump room installations. Right: Experimental installation of propeller-type agitator at a 55,000-bbl. tank





The new forged steel CHIKSAN XH Swivel Joint combines the easy turning and effective pack-off — for which all CHIKSAN Joints are noted — with high capacity. Built of forged steel, with flame-hardened races, this new CHIKSAN Joint is designed for heavy duty services of all kinds. It makes possible the fabrication of all-steel lines with perfect flexibility, yet capable of withstanding working pressures to 12,000 psi... with greater safety and longer life. Engineering data on request.

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suction lines. Each of these booster pumps is piped to serve two 55,000-bbl. tanks. Each of these units is driven by a 25-hp. motor which may be operated either by adjacent push-button control or by remote push-button control at the central board in the pump station building.

Lines from each of the large tanks are laid to grade to facilitate drainage to a common point. Tanks can be drawn down to 2 ft. of bottom due to the arrangement of filling lines, consequently tank bottoms can be maintained at a minimum figure and the useful storage materially increased.

An experimental installation of propeller-type agitators has been made at one of the 55,000-bbl. tanks for testing the possibilities of eliminating tank bottoms. This equipment is of a type used at refineries for blending.

A scraper-trap is located in a covered pit which is so arranged that the scraper may either be stopped at the station or passed by the station.

The Englewood station and terminal have been functionally designed to provide ample capacity and valuable flexibility in delivering crude requirements to meet refinery schedules.

To provide for increased demands for moving New Mexico and West Texas crude oil to the Gulf Coast, a 10 per cent higher throughput has been attained on the main trunk line of Texas-New Mexico Pipe Line Co. by a program which included strategic installation of in-the-line electric booster pumps, larger-diameter plungers on main-line pumps, adding superchargers to diesel engines to obtain more power, and by laying a few additional loops.

Wages of Oil-Industry Employes Show Gain

Weekly earnings of workers in the petroleum industry showed small average gains in September, continuing an increase over wages a year ago.

A report issued by the Bureau of Labor showed the average weekly earnings of refinery workers during September was $58.35, against $57.10 in August and $57.02 in July. Average income of workers in crude production was $53.43 in September, against $53.35 in August and $52.97 in July.

Osages to Grant Test Permits

PAWHUSKA, Okla. — The Osage Indian agency has been authorized by the Osage Tribal Council to permit core drilling and other tests in the county. Council members studying the oil business have visited several Oklahoma and Kansas fields and are reported favoring more waterflood and gas-injection secondary-recovery operations.

QUESTIONS on TECHNOLOGY

by W. L. Nelson
Consulting Engineer

How Detect Contamination of Steam Condensate with Oil

We are condensing steam in tubular coolers and the condensate must be absolutely free from oil. In case a leak occurs how can we detect small amounts of oil?—E.H.R.

All methods of detecting oil in feed water require some time or at least they require constant attention. For this reason it is suggested that one of the filters commonly employed in marine-boiler installations be installed. Generally such a filter consists of two alternate chambers containing a bed of sand or filter clay. The water is treated with 1 grain of aluminum sulfate and ½ grain of caustic soda per gallon before it enters the filter. Such a treatment is necessary in order to "break" any oil water emulsion or even a fine dispersion of oil droplets in water. According to Petroleum Engineer (page 127) of December 1941 and Cochrane Corp. (17th & Allegheny Avenue, Philadelphia) such an installation can be made entirely automatic. The incoming water is passed through an orifice and the pressure differential across the orifice is used to deliver a small amount of the water through the chemical tank and back to the filter. As the amount of emulsion increases it decreases the rate of flow and automatically the rate of feed of chemical.

Suggested Preliminary Test

Cochrane Corp. suggests the following preliminary test for oil contamination. "Just take an ordinary clean test tube, fill it to a depth of about 2 in. with the feed water to be tested, and shake it in your hand for a few minutes with your thumb over the test-tube opening. If at the end of a short period of shaking there is an accumulation of oil globules on the surface of the water you can be positive that there is oil and plenty of it in the feed water."

An excellent but laborious method of test is described in "Disposal of Refinery Wastes," Section 1, Waste Water Containing Oil, Second Edition, 1933, American Petroleum Institute, 250 Park Avenue, New York. The testing of waste water from petroleum refineries requires methods that will keep the oil content to well below 0.01 per cent. The method involves sampling the water with a "thief" which has a capacity of about 1 qt. The thief must be rinsed with solvent after each sample because the oil tends to cling to the walls of the container. The oil is washed from the water with carbon-bisulfide-ether or carbon-techrachloride-ether (or benzol for routine tests). The solvent is evaporated in a tarred dish.

Film Thickness

The appearance of oil films on the surface of water is an extremely sensitive method of test but no very good way of using this method is apparent because the feed water is not out in the open where it can be seen. In oil traps in refineries, the following very small thicknesses of oil films can be detected:

Film thickness, inches	
0.0000015	Barely visible under best light conditions
0.000003	Visible as a silvery sheen
0.000006	First trace of color is apparent
0.000012	Bright bands of color
0.000040	Color begins to turn dull
0.000080	Colors are much darker

Finally, W. W. Pettibone, in the May 1946 issue of Power Plant Engineering (Chicago), states: "I have seen boiler water that appeared to be quite clear and free from oil but when a small sample—25 or 30 cc. or about 1 oz.—was shaken in a bottle with a few cubic centimeters of chloroform, the chloroform would wash out the emulsified oil from the water. The chloroform settling out at the bottom of the bottle on standing (chloroform being heavier than water) would have a decidedly brown color due to its absorption of the oil from the water.

"The sample of boiler water should be well cooled before adding the chloroform. In some cases the appearance of the water before and after shaking will change noticeably. With appreciable amounts of emulsified oil present in the water, it may have a bluish or somewhat iridescent cast, which will be removed on shaking, the water then appearing flat and dull compared to its previous appearance.

"If the water is decanted from the chloroform and the chloroform with its dissolved oil then poured upon a clean blotter, the oil will leave a stain on the blotter after the chloroform evaporates. This chloroform test may also be made a quantitative means of determining the amount of oil present, if the original sample of water is accurately weighed, the chloroform and oil mixture evaporated, then the remaining oil weighed.

"No oil separator or filter will remove emulsified oil, the particles of which range in size down to about 0.00001 in. in diameter. I have seen samples of steam condensate that appeared to be oil free so far as visual evidence of oil being present; but tests showed 20 p.p.m. of emulsified oil in the water. Just how much concentration of this water must occur in the boiler before this oil will show in the gage glass will be dependent upon the chemical nature of the water, coagulants present, and so on."

Open the Valve to Three Spokes

Our stillman says open the valve three spokes. Isn't this a poor way to adjust the flow?—F. E. C.

Plant operators have long been chided for adjusting the rate of flow by the number of spokes or turns that a valve is open. Obviously such a method of control is not accurate because of differences in valves and in their state of repair. Nevertheless, a valve opening is an orifice and could be used as a flow meter if it were calibrated. Just such a calibration has been determined by Kroll and Fairbanks for Crane brass-globe bevel-seat brass-disk ½, ¾, 1 and 1¼-in. valves and their results are published in Ind. Eng. Chem. 37, 588 (1945). They find that flow in new valves can be described by:

$$w = \frac{K\sqrt{p\Delta P}}{1.496}$$

in which p is the density, pounds per cubic foot; ΔP is the pressure drop across the valve, psi.; and K is a constant which has the following approximate values (when examining three of each kind of valve):

VALUES OF THE CONSTANT K

No. of turns open	Valve size (in.) ½	¾	1	1¼
¼	.021	.039	.051	.07
½	.043	.070	.11	.15
1	.077	.12	.2	.27
2	.099	.18	.29	.41
3	.104	.197	.32	.48
4	.100	.2	.33	.51

The average deviations in the tests were within 5 per cent for the small valves and 3 per cent for the 1¼-in. valve.

This does not, however, completely answer the question of how much liquid flows through a valve at various settings because it is necessary to determine the pressure drop experimentally.

Electrical Well Logging: A Study of the

SELF-POTENTIAL CURVE

by Charles C. White*

THE phenomenon of self potential has been recognized for a number of years as being composed of two separate and distinct voltages of which it is the algebraic sum. Hence either will add to, cancel out, overbalance, or deduct from the effect of the other. Its resolution into electrochemical potential and electrofiltration potential—the two component parts—however, has received scant attention.

The chief cause of electrochemical self potential is the setting up of a concentration cell when two waters of different salinities meet. This has been demonstrated by separating two unlike waters by a porous membrane and placing electrodes of the same metal in each. In electric-logging application, the two waters of different salinity are the drilling water and the water in the formations encountered. The potential setup may be expressed mathematically as follows:

$$SP_{ec} = K \log_{10} \frac{r_m}{r_{sw}}$$

where

K is a constant dependent on the nature of the dissolved salts, and the character of the surrounding material.

r_m is the resistivity of the drilling fluid, and

r_{sw} is the resistivity of the water in the formation being considered.

Most often the salinity of drilling fluid is much less than that of the water in the formations penetrated and SP_{ec} is negative in value. Occasionally with salty mud the salinity of the drilling fluid is greater than that of the waters in shallow sands and positive anomalies are shown. Just how much of the self potential

*Consulting petroleum engineer, Evansville, Ind.

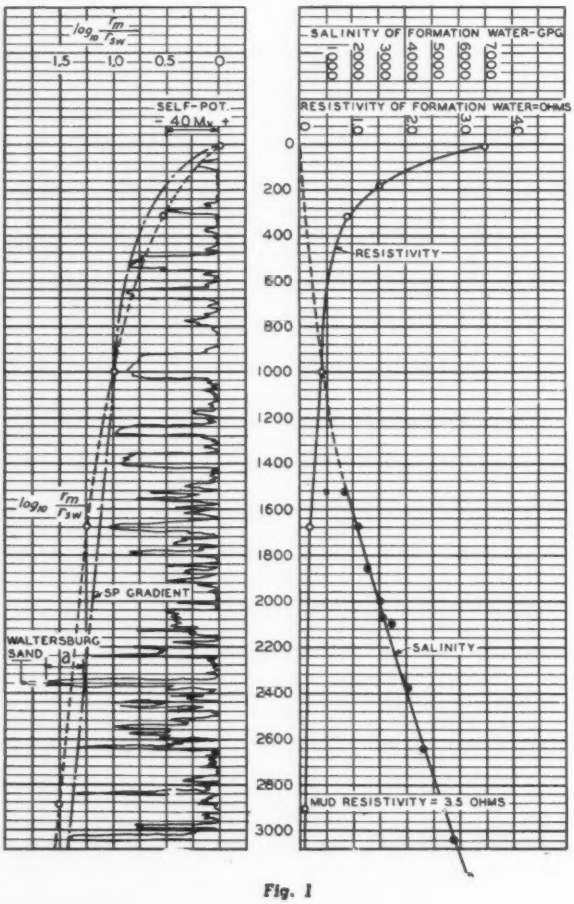


Fig. 1

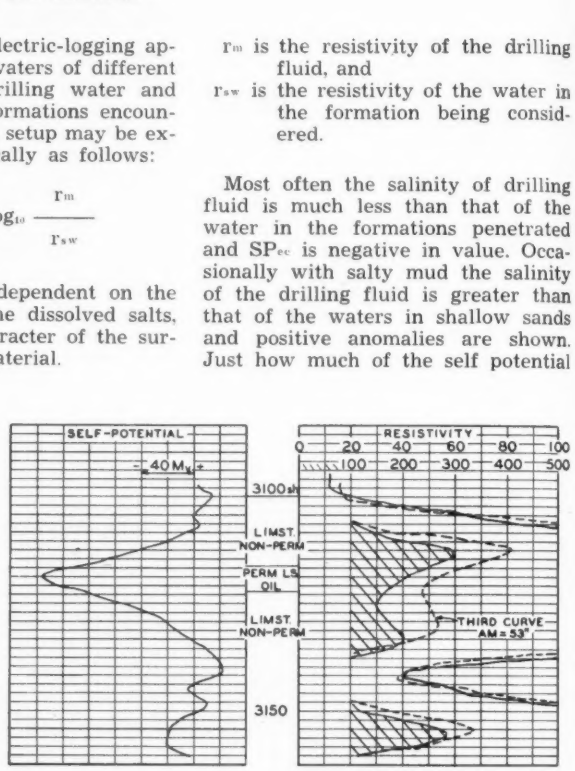


Fig. 2

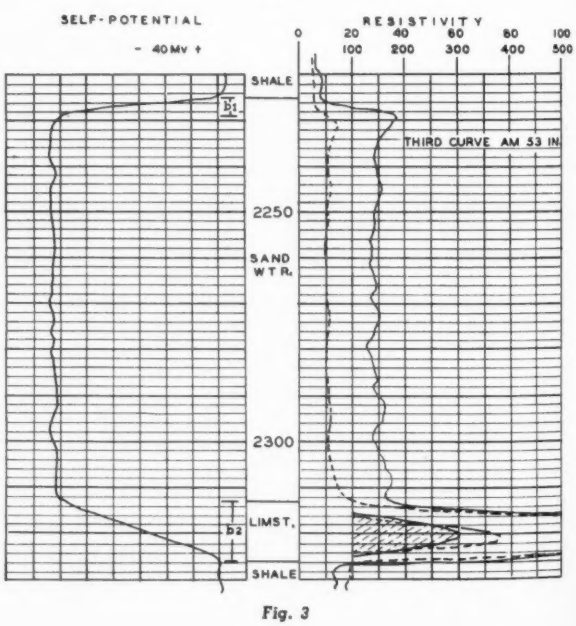


Fig. 3

on an ordinary log is due to this factor will be shown presently.

The other principal cause of self potential is the movement of fluid back into permeable formations. In the physical-chemistry laboratory it has been shown that minute solid particles suspended in a fluid can be caused to migrate by the application of a potential across the fluid. This is known as cataphoresis. If the particles are stationary as in a sandstone and the fluid moves, an opposite potential will be generated. This is termed streaming potential and may be simply demonstrated by causing a fluid to flow through a permeable core and measuring the potential difference existing between the two ends of the core. Streaming potential or electro-filtration potential occurs when drilling fluid invades a porous formation. This potential may be expressed as follows:

$$SP_{ef} = K_1 \frac{R\Delta P}{V}$$

where

K_1 is a constant dependent on permeability,

R is the resistivity of the invading fluid,

ΔP is the differential pressure acting across the face of the porous zone.

V is the viscosity of the liquid.

H. Guyod has made the statement that self potential is nearly all of electrochemical origin. Here an endeavor will be made to separate the two sources and evaluate each for a particular case. In order to determine how much of the self potential for a given well is due to each cause, the salinities which ordinarily exist at various depths may be examined. Fig. 1 shows the salinities for waters in the South Albion field of Edwards County, Illinois, as measured from samples actually produced. A curve which shows the corresponding resistivities for these waters is presented in the same figure. It is probable that the approximate straight line extrapolation of salinities from near the surface to 1,500 ft. is in error since it is more likely that higher salinities would exist up to a depth of 300 or 400 ft. and that infiltration of surface waters would cause a sharp drop in salinity with decreasing depth above this point. Since the electrochemical self potential is proportional to

$$\log_{10} \frac{r_m}{r_{sw}}$$

a curve representing this value is plotted to suitable scale opposite the self-potential curve of a typical well in this field. A striking similarity is seen to exist between these two curves which indicates that the major portion of the self potential in this well at the time of measurement was due to electrochemical sources. If the

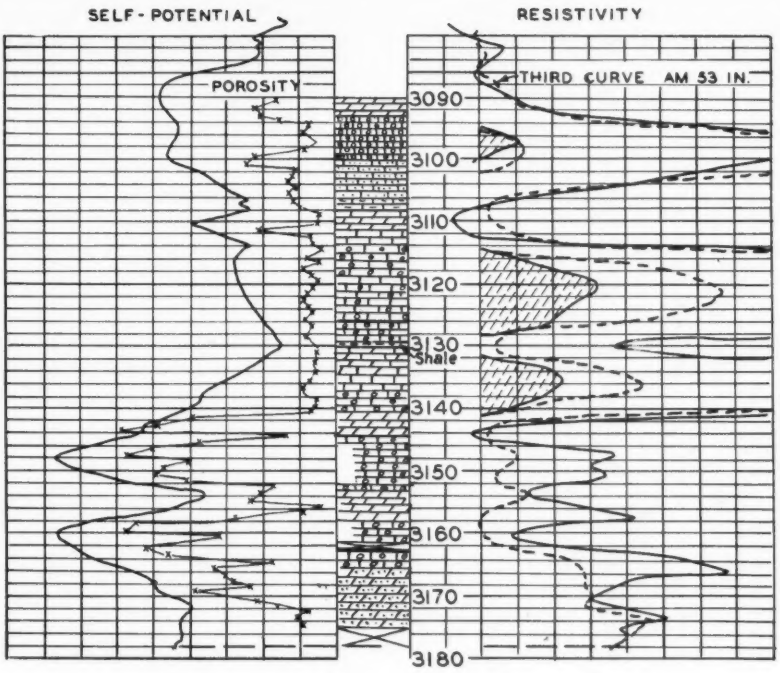


Fig. 4

actual salinities which occur above 1,500 ft. are as suggested above our correlation would be even better. Fig. 1 may be considered the most pessimistic correlation.

The Waltersburg sand at 2,353-2,370 ft. (Fig. 1) shows an increment of self potential greater than normal, a, of 29 mv. Normal self potential as shown by the gradient would have been 100 mv. This sand was known to have a bottom-hole pressure of approximately 300 psi. at the time of the electrical survey. Original bottom hole pressure was 925 psi. This additional 29 mv. was the result of the additional pressure differential on the sand face of 925 less 300 or 625 psi. This is 1 mv. of electrofiltration potential for each 21.5 psi. pressure differential. Mud weight was 9.8 lb. per gal. and the weight of the mud column at the Waltersburg sand represented a pressure of 1,204 psi. Normal differential pressure at the sand face would have been 1,204 less 925 or 279 psi. The quotient of 279/21.6 or some 13 mv. should have been due to electrofiltration at this depth had the Waltersburg sand still had its original reservoir pressure. Normally 13 per cent of the self potential at this depth would have been caused by electrofiltration potential and 87 per cent by electrochemical potential. The percentage should be slightly greater for electrofiltration at greater depth and less for shallower depths.

Mudding off will affect the actual permeability of the sand face and cause K_1 to change considerably. Therefore no claim can be made that the above calculations are strictly accurate. They do, however, show that with light or medium-weight drilling muds of 2 ohms restivity or over, electrofiltration plays a minor though nevertheless important part.

Self potential has generally been studied from a static viewpoint, i.e., as a potential which exists with no current flowing. Such a condition would be attained only in an insulating medium or approached in very dense formations in a well containing very fresh and high-resistant mud. Self potential is in reality a dynamic quantity, i.e. it is a potential or charge which exists in a more or less conductive medium and is dependent on the constant generation of a potential in the face of a tendency for the potential or charge to be dissipated by causing a current to flow away from the region in which it originated. The amount of potential evidenced on the electric log is dependent on the tendency of the mud and the surrounding formations to carry it away and also on the strength of the source of potential. Ordinarily it is the resistivity of the adjacent formations which chiefly influences the maintaining of a potential since we would not be able to secure an accurate resistivity measurement of the surrounding formations if the resistance of the mud in the well bore were of more than minor importance. The strength of the source of potential is dependent, in the case of electrochemical potential, on the salinities and nature of salts dissolved in the two fluids, to porosity, or amount of fluid contained in the potential source and to the thickness of the porous bed. For electrofiltration potential the strength of the source is dependent

on the rate of filtration, resistivity of the fluid, and thickness of the permeable zone.

This is strikingly exemplified by the sharpness of self-potential changes in low-resistant porous formations and high-resistant porous formations. Fig. 2 shows a porous zone of some 240 ohms (third curve) existing between even higher-resistant beds. It may be noted that the self potential anomaly caused by this 5-ft. porous zone spreads over an additional 20 ft. Fig. 3 shows a sand with a shale above and a dense limestone below. At the top of the sand the self potential curve shows a change from porous sand to shale, b_1 in 4 ft., but it requires 13 ft., b_2, for the self potential to change from its value in the porous sand to the value of the shale below the impervious limestone. If the limestone bed had been thicker the change similarly would not have been as rapid and would not have reached the shale line until actually through the limestone. All this explains why ordinarily more self potential is found present opposite a permeable limestone bed of small thickness than opposite a comparable sand. In the higher-resistant limestone potentials generated do not leak away as readily and a higher potential must be built up before expecting permeability.

The fact that the intensity of the potential or charge is proportional not only to the amount of electrofiltration and intensity of electrochemical reaction but also to the ability of the source to maintain the potential may be likened to the fact that a storage battery will read full voltage when no current flows, but when connected to a low-resistance load the voltage measured across the terminals of the battery will be less, due to the drop of potential through the internal resistance of the battery. A shaly sand is comparable to a small battery having a high internal resistance which cannot maintain as much potential as can a well-developed sand —which is comparable to a large battery with very low internal resistance drop and which maintains practically its entire potential across a similar low external resistance. In this case the external circuit of each battery is composed of surrounding formations and drilling mud in the well bore.

Wherever porosity occurs there is found an electrochemical potential (there may even be some small constant amount of electrochemical potential opposite shale zones), but electrofiltration potential can be generated only where there is fluid movement into the well strata, i.e. where there is permeability. Impervious shaly sands, sucrose dolomites, and limestones of low porosity all exhibit electrofiltration potential only. Since the electrochemical potential which can be maintained is proportional not only to porosity but also to thickness and resistivity, a correlation between porosity and self potential should be found to show this.

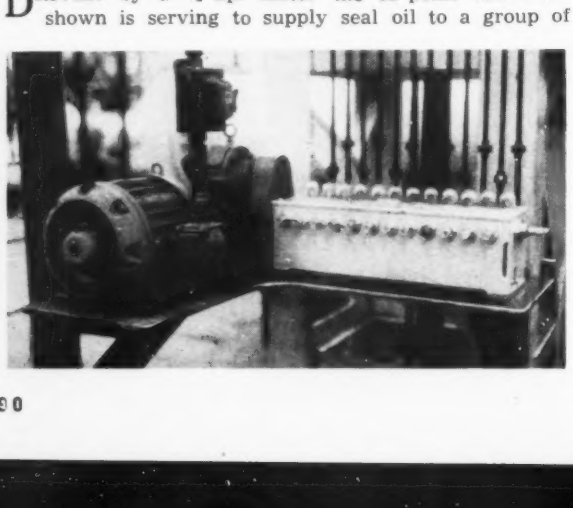
Fig. 4 is an interesting example of this and a study of why the self-potential curve behaves as it does in this instance should throw light on many similar instances. There is an impervious zone of some porosity from 3,091 to 3,094 and another from 3,099 to 3,101. Both these zones show electrochemical self potential. The oolitic limestone zone between is dense and high resistant. Therefore, there should be expected little leakage of potential away from these two sources to occur in its direction. This is confirmed by the fact that the self potential is maintained with only a small movement toward the shale line through this dense zone in spite of the very low porosity there. Conversely the self potential should be expected to be less easily maintained through the lower-resistant sandy dolomite and argillaceous limestone zones from 3,101 to 3,108, and its movement in close to the shale line and out again for the thin dolomite below can thus be explained. There is but little self potential through the dense interval from 3,112 to 3,136 with a minimum opposite the foot of shale at 3,130, and an increase at the bottom as porosity is approached through a dense, high-resistant zone. The dolomite below has good porosity at 3143.5 but insufficient thickness to cause a large anomaly. The permeable zone 3,146 to 3,152 brings into play some electrofiltration potential in order to create a self-potential maximum and so does the zone 3,158 to 3,162. Below this self potential correlates roughly with porosity, with the low-porosity zones at 3,161.5 and 3,164.5 and the medium porosity zone at 3,169.5 not thick enough to cause more than a waver in the self-potential trend.

It has been suggested by some that self potential will be less in a high-resistant bed and the fact that oil and gas sands show slightly diminished values of self potential cited as proof. The author contends that the smaller self-potential values which may be found in oil and gas sands are related to the smaller amount of salt water in these sands. It is true that diminution of self potential is greater for sands of low connate-water content and resistivity is also higher for such sands, but while both these circumstances stem from the same cause they are unrelated and the presence of high resistivities does not in itself cause diminution of self potential.

Just what part the portion of porosity occupied by oil plays is not entirely clear. Why it seems to be mainly the porosity and not the portion of porosity containing salt water which causes self potential of oil and gas sands is difficult to imagine. It appears that in the process of accumulation the oil and gas were able to displace a large portion of the water present but had little effect on some other factor or relationship which is definitely related to electrochemical potential. This and the many other problems of self potential offer a field of interesting study and research.

Plant Practices: Lubricator Supplies Seal Oil to Pumps

DRIVEN by a ½-hp. motor the 12-point lubricator shown is serving to supply seal oil to a group of pumps operating in Continental Oil Co.'s Wichita Falls, poly plant. A standard-type worm-gear speed reducer is connected with a flexible coupling to the lubricator driveshaft. Motor, speed reducer, and lubricator are mounted on a single-base plate in order to maintain alignment of the transmission system. Flexible couplings between the speed reducer, motor, and lubricator facilitate assembling these parts on the baseplate. Ordinary steel pipe, which has been thoroughly cleaned to remove scale and other undesirable material from its inside surface, is used to connect the lubricator to the seal points on the pumps. After a short period in which feed rate adjustments to the different pumps were made, the device has given excellent service without need of attention to its mechanical parts. As a safety measure check valves are installed in the tapped openings that are provided for sealing the pump.



Avoid Carbon Monoxide

by Henry W. Boggess*

CARBON monoxide is a product of incomplete combustion. Whenever materials containing carbon are burned with insufficient oxygen to give complete oxidation, carbon monoxide is manufactured.

The death rate from carbon monoxide poisoning rose 19 per cent in 1943 over 1942 and accounted for 1,754 American lives.

The great danger of CO lies in the fact that it is odorless and colorless in ordinary concentrations. It cannot be tasted and it does not irritate delicate membranes. It has a specific gravity of 0.967 and therefore readily mixes with air. It kills without warning.

Oil-field workers and their families are particularly vulnerable to carbon monoxide because of the high ratio of internal-combustion motors and engines and because open gas fires are generally used for heating. Protection from carbon-monoxide poisoning arising from common

SAFE field PRACTICES

sources depends upon adequate ventilation and continuous attention to the elimination of those sources.

Automobile drivers must be sure that exhaust gases do not get into closed cars. Before the winter season, when cars are generally driven with windows closed, exhaust systems should be checked for defects and leaks. Blown out gaskets should be replaced, manifold and exhaust pipes and connections should be gone over and tightened, and all holes in mufflers and pipes should be eliminated. No car or truck motor should be run in a closed garage. Company garages, where tune-up work is done on several cars, should be inexpensively equipped with a horizontal pipe of 3 or 4-in. diameter extending to the outside of the building and onto which exhaust pipes of cars and trucks can be attached.

*Superintendent, Employment-Insurance and Safety, Sinclair Prairie Oil Co.

(Continued on page 111)

YOUR BEST THREAD PROTECTION

ALL WECO Thread Compounds are carefully mixed from tested formulas to save and protect your threads.

Blended with a *metallic lead base*, WECO STEEL-AID will not harden. It will withstand pressures and temperatures. STEEL-AID allows joints to be broken out after great lengths of service. Recommended especially for drill collars, Xmas Trees, testing racks or any thread connection where extremely high pressures are encountered.

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Recovery of Barite from Rotary Drilling Mud by Centrifugal Separation

*by Charles A. Lindsay**

SUCCESSFUL application of continuous-type centrifuges in the rotary-drilling industry for extracting sand and cuttings from rotary drilling mud is established. More recently, these machines have been used on rigs for weight-material recovery and mud conditioning.

Until the last decade, centrifugal separations of the type here under discussion, were limited to batch or cyclical methods, whereby discharge of one or more products was made intermittently from a rotor or basket. While these methods were successful in a great many of their applications, satisfactory results were not obtained where the separation consisted in the removal of high percentages of solids suspended in a liquid, it being necessary to expend too much time and labor for the intermittent discharging of the solids. The continuous type of centrifuge used in the operation to be described, has overcome the objections of intermittent discharge. The centrifuge under discussion is characterized by its ability to operate with a continuous feed and a continuous discharge of separated products.

*Merco Centrifugal Co., San Francisco.

The usual heavy drilling mud contains three solid constituents: bentonite or clay, sands of 2.6 specific gravity, and barite or witherite (4.4 to 4.6 specific gravity) which is usually available at a specific gravity of only 3.9 to 4.2. Bentonite or clay normally consist of colloids and particles small enough to be held permanently in suspension. The +200-mesh sands are largely removed by combined chemical conditioning and screening whereas the —200-mesh barite is held in suspension by adjusting gel strength and viscosity to counteract the settling tendency. During drilling operations the mud is continually becoming contaminated with excess colloids, cuttings, sand, oil, gas, and salt, from the formation encountered. Where oil, gas, and salt-water contamination is excessive the barite consumption is usually excessive.

By the simple expedient of freshwater dilution to reduce the viscosity and decrease the gel strength, drilling mud can be conditioned for centrifuging after the cuttings and +200-mesh sands have been removed. The centrifugal operation consists in separating barite as a heavy concentrate and rejecting lightened mud containing slimes and contaminating fractions. Efficiency of this separation varies from 85 to 95 per cent recovery of the weighting material, depending upon variations in feed, weight of desired concentrate and g.p.m. throughput. A certain amount of fine sand in the feed will find its way into the barite concentrate but actual field experience discloses that the percentage is small and of slight consequence.

Enough slime can be thrown down with the barite concentrate to build up the viscosity sufficiently to keep contained barite in suspension, and is accomplished by lessening fresh water dilution of the feed. This, however, is only necessary when the recovered weighting material is to be stored or transferred. Weight of the concentrate can be held at any desired figure up to 135 lb. per cu. ft.

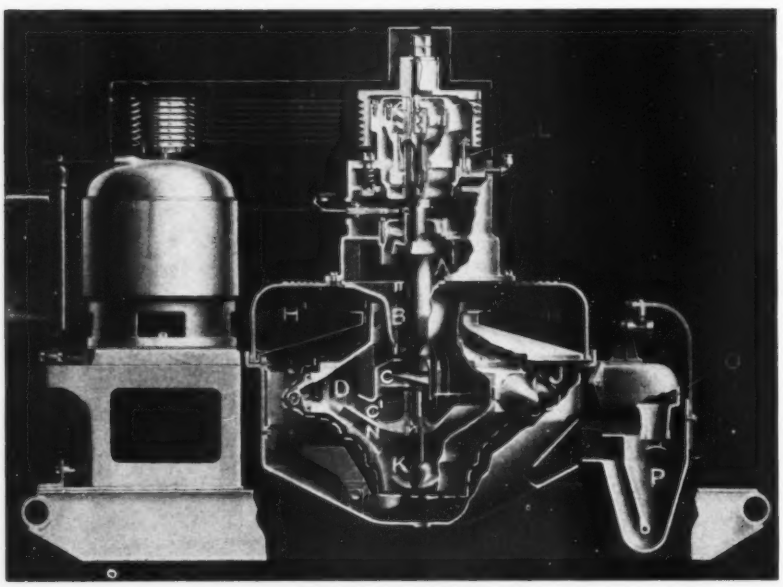

Fig. 1—Centrifugal concentrator operating diagram

Operation of the Centrifuge

A brief consideration of the operating principles of the separator used will assist in a clearer understanding of the results obtainable. Fig. 1 shows a cross sectional view of the centrifuge which is designed to continuously separate solids from fluids. These solids are discharged with enough fluid to allow easy flow.

The rotor (outlined with a dotted

(Continued on page 96)

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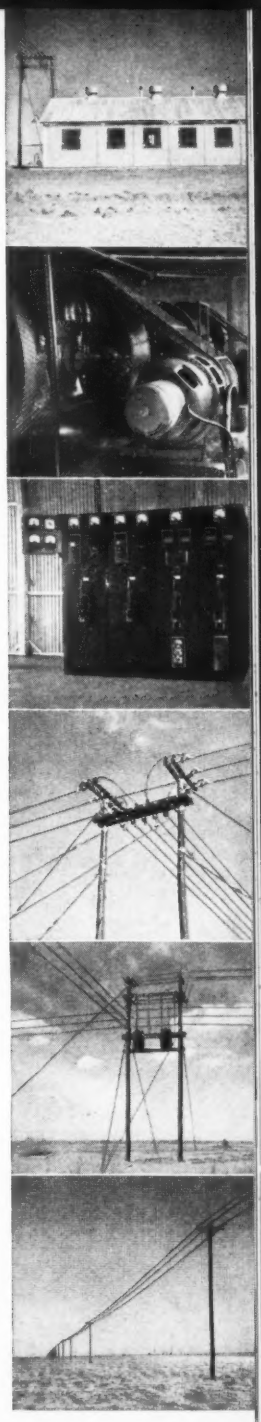

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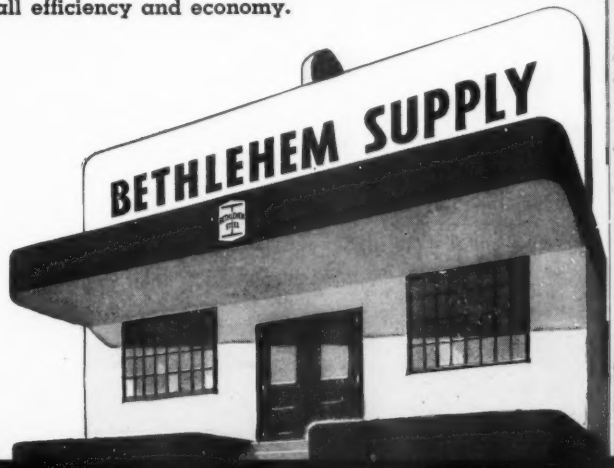

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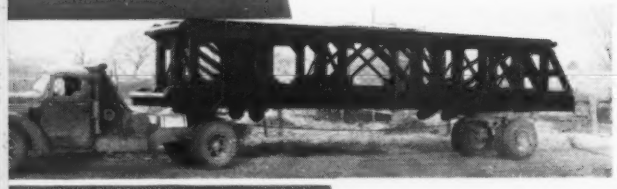

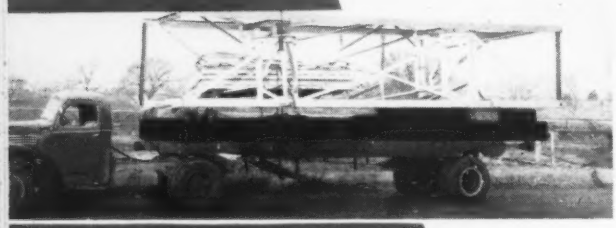

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Moore Masts are available in heights of:
87′ capacity 300,000 lbs., 95′ capacity 360,000 lbs., 98′ capacity 450,000 lbs., 127′ capacity 450,000 lbs., 129′ capacity 450,000 lbs., 136′ capacity 720,000 lbs.

The 87′, 95′ and 98′ masts including skid base, crown block and racking platform can be transported on two trailer trucks. Three trucks are required to transport the 127′ mast. The 129′ and 136′ masts, which are furnished with a large sub-structure, require four trucks.

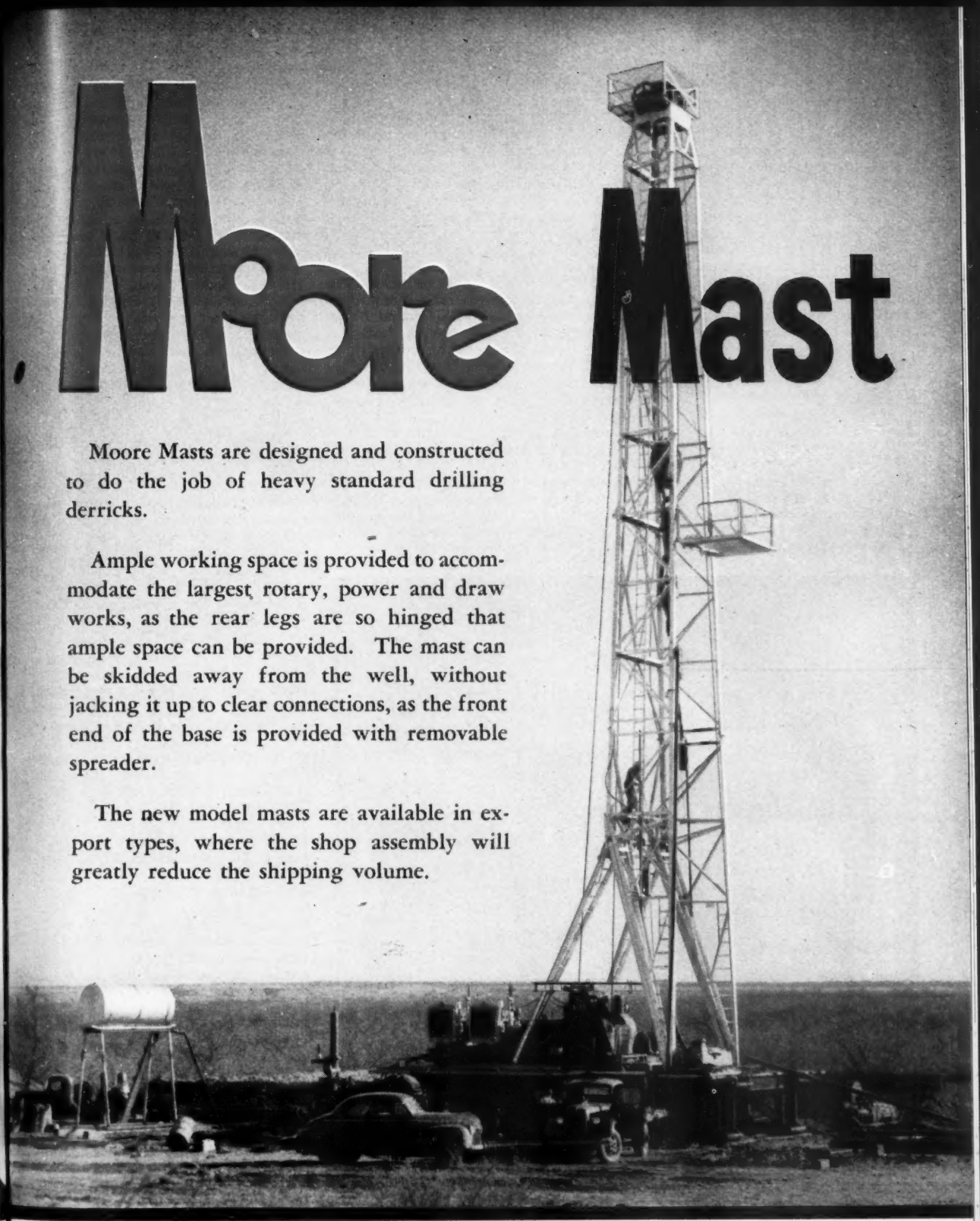
Once on location all assembling and stringing-up is done on the ground. Approximately 2 minutes are required to raise the mast from the horizontal to the final operating position. The gin pole is an integral part of the mast; no guy lines are required.

Moore Mast

Moore Masts are designed and constructed to do the job of heavy standard drilling derricks.

Ample working space is provided to accommodate the largest rotary, power and draw works, as the rear legs are so hinged that ample space can be provided. The mast can be skidded away from the well, without jacking it up to clear connections, as the front end of the base is provided with removable spreader.

The new model masts are available in export types, where the shop assembly will greatly reduce the shipping volume.



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line, Fig. 1), with its shaft, is the only part of the apparatus subjected to movement. Mud is fed into the feed well A, and drops through the pipe B to the feed impeller C, where it picks up rotation from the vanes of the impeller. The feed is discharged through the peripheral opening C′ into the separating chamber D which it completely fills. Overflow occurs at the lip F, the overflowing mud as waste leaves the machine through port H′. While the material being treated is flowing from C′ to F the centrifugal force exerted on it settles out the solids which accumulate at the periphery of the rotor in pockets G which terminate in nozzles. The fluid containing the concentrates is discharged out of the nozzle into the housing J and is known as the underflow. This accumulates in the bottom and is pumped back into the rotor by the conical pump K, through passages N, which again discharge into pockets G at the mouth of the nozzles. The recirculation of the underflow slurry is called the return, and performs three essential functions. First, it automatically augments the feed to a degree that will prevent all of the fluid from going out through the nozzles, in which case there would be no overflow. Second, it keeps the mouths of the nozzles from becoming packed with solids, thus preventing plugging of the nozzles. Third, it concentrates the solids to a degree that will permit discharge from the machine without an excessive amount of liquid in the underflow.

As the heavy fluid is discharged from the nozzles, part of it is caught in launder H, which extends one-quarter of the way around the housing J. The fluid in this launder flows out through a port O and drops into the bucket P, which is a part of the specific gravity device (See Fig. 2). This device performs an important function in the separation, in that it controls the concentration of the solids discharged from the machine. To set the counterweight T for proper discharge the stream flowing from V and U′ should be split at the sloping partition W when the desired specific gravity of the concentrate is reached.

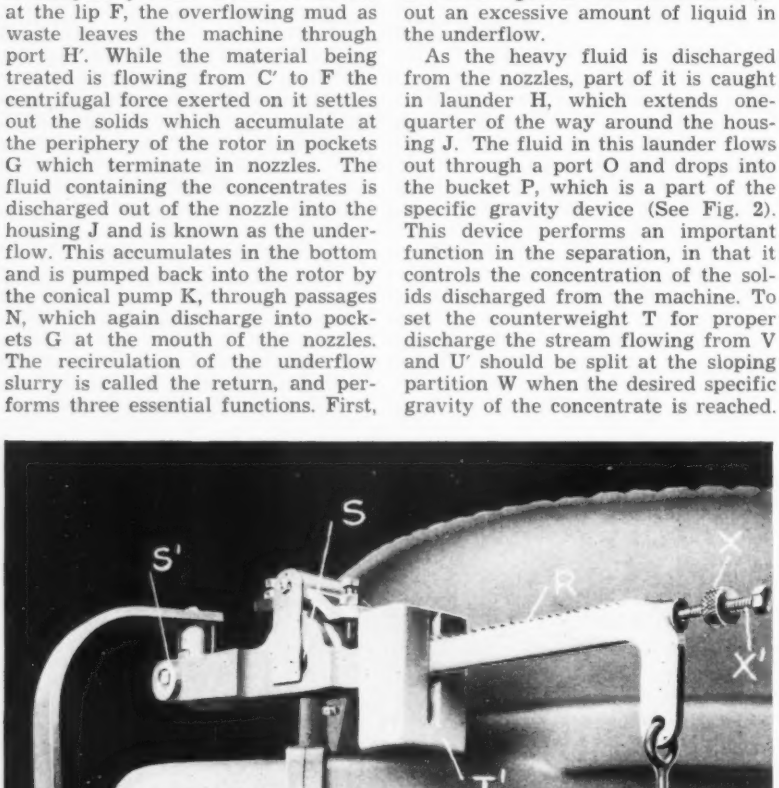


Fig. 2—Specific gravity device operating diagram

Once set, the operation of the discharge is automatic, as the bucket will lower and rise to compensate for change in density coming out of the nozzles. When the bucket lowers (due to greater density of the fluid) more of the stream below W leaves the machine, when it rises (due to lesser density of the fluid) more of the stream drops into Z, from whence it flows back into the lower housing and is picked up by the pump K (See Fig. 1), to be further concentrated.

Nozzles on the periphery of the bowl play an important part in the operation of the centrifuge, and it is essential that oversize particles which can foul the ⅛ or 5/32-in. nozzle openings do not enter the machine.

Operating Arrangement

The installation to be described, produced, with good recovery of weight material, a mud concentrate of better than 120 lb. per cu. ft., possessing properties suitable for reuse and ability to keep the more dense solids in suspension during storage periods. On a rig working at Rio Bravo, Calif., it was necessary to repulp the mud before centrifuging began because considerable evaporation of water had taken place during the storage period preceding the recovery of barite.

A 12 by 6¾ by 14-in. steam-driven slush pump was used for the circulation of sump material and its removal to the separator. Mixing was done with two mud guns which were placed at varied locations around the embankments enclosing the sump (100 by 100 ft. square by 10 ft. deep). Two men worked approximately 24 hours mixing the top several feet of the sump to a dilution of 30 to 35 per cent solids. Enough mud was circulated and jetted back to keep the sump material continuously agitated and mixing. Fifty to 75 g.p.m. of pump discharge was piped directly to the 60-mesh vibrating screen and diluted with fresh water. The —60-mesh screen product flowed directly to the centrifuge through a stationary check screen which cut off any stray oversize which might have bypassed the shaker. Fig. 3 is illustrative of the flow of material. Overflow tailings were discharged along a wooden launder to a nearby production sump and when accumulated in quantity were pumped away as waste. The underflow concentrate was collected in a small sump and two 100-bbl. tanks and transferred to tank trucks for shipment to operating rigs.

The concentrates were stored for periods up to several days before removal to the rig by truck. Enough colloid was brought down with the barite to act as a suspending medium and no settling of any consequence took place. The concentrate apparently would have stayed in its suspended condition for several weeks if placed in a storage tank or sump,

where it could be given occasional circulation or gunning. However, in some instances, sufficient colloid may not be present to provide proper suspension for barite in the wet concentrate. The addition of quebracho to the concentrate helps to increase the gel strength and suspending properties of the concentrate (as illustrated in column 2 of Table 3), and this procedure might correct entirely any tendency toward settlement after concentration. It may be safely stated that if there is little tendency toward settlement of the barite when present in the mud before dilution, it will stay in suspension after concentration.

Testing Procedure

It was necessary, in order to check the operating results of the centrifuge, to make analyses different from those usually made on drilling muds. The methods employed were found to be simple and accurate. The primary data necessary to evaluate the operation of the centrifuge are: How much weight material is being fed to the machine? How much weight material is being removed from the machine as concentrate and what recovery is being made?

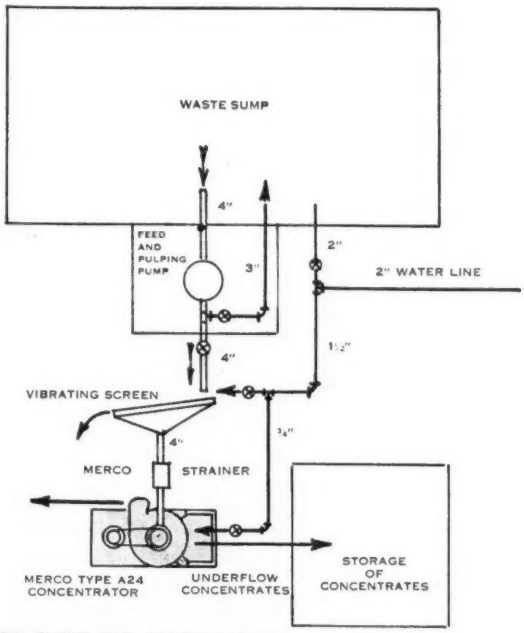
First step in determining the percentage of dry weight material contained in a mud sample is a combined specific gravity of pulp and per cent solids analysis. This may be done as follows: A pint container with ground-glass top and cover is used as a pycnometer: (any wide-mouth pycnometer of 250 to 400-cc. capacity is suitable) its tare, and volume in cubic centimeters are known. This vessel is filled with the sample to be analyzed, weighed, and the tare subtracted from this weight, giving the weight of a known volume of material. Since

$$\frac{\text{Weight (in gm.)}}{\text{Volume (in cc.)}} = \text{sp. gr.}$$

the specific gravity of pulp is determined by calculation. The contents of this container are then carefully washed with a fine stream into a stainless-steel, aluminum, or other suitable pan whose tare is known. This material is then carefully dried on a hot plate and the dry weight of solids determined. The ratio: dry weight/wet weight, gives the per cent solids. The specific gravity of the total dry solids can then be calculated as follows:

Weight wet solids — weight dry solids = wt. water in gm.

Volume container — volume water = vol. dry solids.



FLOW SHEET FOR CONCENTRATING WEIGHTING MATERIAL FROM WASTE SUMP

Fig. 3—Showing arrangement of vibrating screen and centrifuge

TABLE 1—TABULATION AND DISCUSSION OF RESULTS

	Run time (hr.)	Tons* Barite/hr. in feed	Tons Barite/hr. recovered	Per cent recovery	Wt. in lb./cu. ft. of mud concentrate	Value of recovery/hr. (Barite at $30 ton)
1	1¼	1.92	1.75	91	121	$52.50
2	4½	1.24	1.04	83.9	132	31.20
3	8	2.78	2.70	96.9	126	81.00
4	8	1.11	1.11	100	129	33.30
5	8	2.42	2.22	91.6	126	66.60
6	8	2.02	1.78	88.2	124.5	53.40

*Barite is assumed to have a specific gravity of 4.1, which is in line with the quality of the usual commercial product.

$$\frac{\text{Weight dry solids in gm.}}{\text{Volume dry solids in cc.}} = \text{sp. gr. dry solids}$$

The per cent weight material of 4.1 sp. gr. is calculated from the following relationship whose derivation is indicated:

Let A = sp. gr. total dry solids
1 — x = 2.6 sp. gr. material (2.6 assumed for all solids except weight material)
x = 4.1 material

$$\frac{\text{Weight}}{\text{Volume}} = \frac{1}{\frac{100 - X}{2.6} + \frac{X}{4.1}}$$

$$\text{or } X = 100\,\frac{(4.1A - 10.66)}{1.5A}$$

The tons weight material per hour and per cent recovery are determined as follows:

$$\text{G.p.m.} \times \text{sp. gr. mud or slurry} \times \frac{\text{per cent solids}}{100} \times \frac{\text{per cent 4.1 weight material}}{100} \times 0.25$$

= tons weight material per hour.

The simplest way to determine g.p.m. is through the use of a V-notch weir which can be placed to measure

TABLE 2—TEST DATA FOR RIO BRAVO OPERATION

	Run number					
Feed—	1	2	3	4	5	6
Sp. gr. mud	1.191	1.10	1.189	1.082	1.172	1.15
Per cent solids	22.8	12.9	22.6	11.0	21.1	19.0
Sp. gr. solids	3.31	3.30	3.34	3.26	3.29	3.24
Per cent 4.1 Barite*	13.6	7.6	13.7	6.1	12.1	10.3
G.p.m.	47.5	59.5	68.0	67.5	68.0	68.0
Underflow—						
Sp. gr. mud	1.93	2.10	2.02	2.061	2.02	1.99
Per cent solids	67.3	72.2	69.9	70.5	71.6	69.8
Sp. gr. solids	3.53	3.64	3.55	3.71	3.67	3.48
Per cent 4.1 Barite*	48.2	56.0	51.2	57.8	57.4	48.5
Overflow—						
Sp. gr. mud	1.061	1.041	1.061	1.03	1.059	1.061
Per cent solids	8.6	5.9	9.0	4.2	8.4	9.1
Sp. gr. solids	2.79	2.88	2.66	2.60	2.75	2.75
Per cent 4.1 Barite*	1.6	1.6	0.6		1.3	1.6
G.p.m.	40.0	52.0	60.0	60.0	60.0	60.0

*This figure is the percentage, by weight, of barite contained in the total wet material.

TABLE 3—OTHER PROPERTIES OF CONCENTRATE

Run—	No. 1	No. 1 (Quebracho and pyrophosphate added)	No. 2
Mud weight, lb.	121	121	132
Viscosity: (March funnel 500 cc. in, 500 cc. out), sec.	44	35	44
Water loss:			
Five minute, cc.	25	7	45
Filter cake, in.	1	3/32	1
Gel strength, lb./100 sq. ft.:			
Initial	5	0	...
10 min.	12	4	...
Salt content, gr./gal.	480	480	380

feed or overflow. The gallons of underflow which have to be subtracted to determine the quantity of overflow if the feed is measured, and if the weir is placed to measure overflow the underflow gallonage has to be added to determine feed g.p.m.

Tests Made in Duplicate

The testing procedure and calculations described above were used in compiling the data which follow. All tests were made in duplicate and the means of the two determinations taken are correct unless the variance was large, in which case the tests were repeated.

Table 1 is illustrative of the results achieved during the initial operations at Rio Bravo. Composite samples were taken for each day's run and these samples constituted the bases for the data presented. It is likely that 95 per cent is the optimum figure for any operation and that certain muds will yield a lower recovery. The runs tabulated represent considerable experimentation in quantity and dilution of the feed, and variations in percentage recovery can be partly ascribed to this fact. It was finally decided to hold the centrifuge feed at from 1.15 to 1.19 sp. gr. (equivalent to a mud weight of 72 to 75 lb. per cu. ft.) on this particular operation, and to adjust the underflow to 120 to 125 lb. per cu. ft.; although it was possible to provide concentrates up to 145 lb. per cu. ft.

Certain conclusions can be drawn from a study of Tables 1 and 2. Barite recovery can be maintained at 90 to 95 per cent while concentrating to a mud weight of from 120 to 130 lb. per cu. ft. Exclusive of other considerations the mean recovery for the five runs, excluding the run where a figure of 100 per cent is shown, is 90.2 per cent. Basing consideration on the "ratchet principle" this figure can surely be bettered as variables are considered, and discarded or accepted as improvements in operating efficiency. Capacity of the centrifuge is 2 tons of recovered barite per hour. This represents a value of approximately $60 per hour of operation in terms of a new purchase of weight material where the price is $30 per ton delivered.

Double Purpose of Water

While not well illustrated by the results presented, because the range of dilution was favorable in all tests, the centrifugal separation of barite is most efficient when the dilution is greatest, although high dilutions will decrease capacity. Some situations will occur when salt-water contamination decreases dispersion to such an extent that increased dilution will be necessary. When this condition occurs the excess fresh water added will serve a double purpose, that of improving separation and decreasing salt content of the concentrate.

It will be noted that the lowest recovery was obtained in Run 2, where the underflow concentrate was heaviest—132 lb. per cu. ft. This can be expected—recovery falls off when the specific gravity of the underflow is increased beyond an optimum limit which has to be determined for any installation.

The sand content of the concentrate is an important consideration in an evaluation of the results of this barite recovery operation. Granular material present in the centrifuge feed will become a part of the final concentrate. The action of 60-mesh screen ahead of the separator is to remove as much of the +200-mesh sands as is possible. The material reaching this screen has three major solid constituents: +60-mesh sand, colloids and —200-mesh barite (approximately 5 per cent +325 mesh) which it is desirable to separate into as follows:

(a) Screen oversize containing +200-mesh sands.

(b) Screen undersize containing barite and colloid or slime.

This objective was closely approached.

Certain other properties of the concentrate produced, outside of those already discussed, are worth mentioning here and are tabulated in Table 3 for two runs.

The difference in properties caused by the addition of 20 cc. of 10 per cent pyrophosphate solution and 20 cc. of 10 per cent quebracho solution to 500 cc. of mud concentrate is interesting. This addition gives satisfactory gel strength, water loss, and viscosity to the product and reduces the filter loss to a reasonable figure. The salt content is lower than that of the original sump material because of the fresh-water dilution which took place before the feed reached the centrifuge, and considerable salt originally in the feed had been removed in the overflow or tailings. Dilution of the concentrate will give a resulting mud of low salt content. The implication is apparent as to the possibilities of lowering mud-salt content at the rig by dilution and concentration using a centrifugal concentrator.

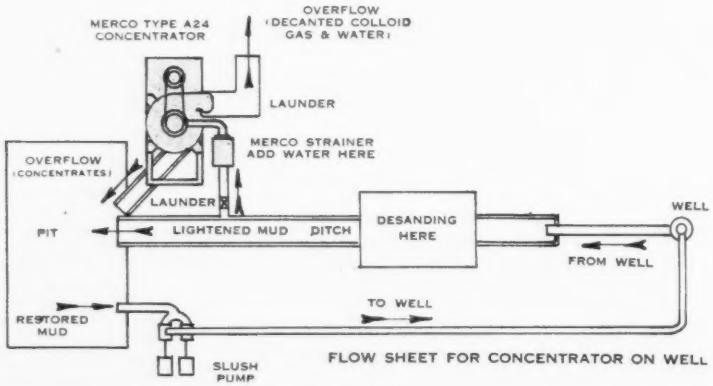


Fig. 4—Flow diagram

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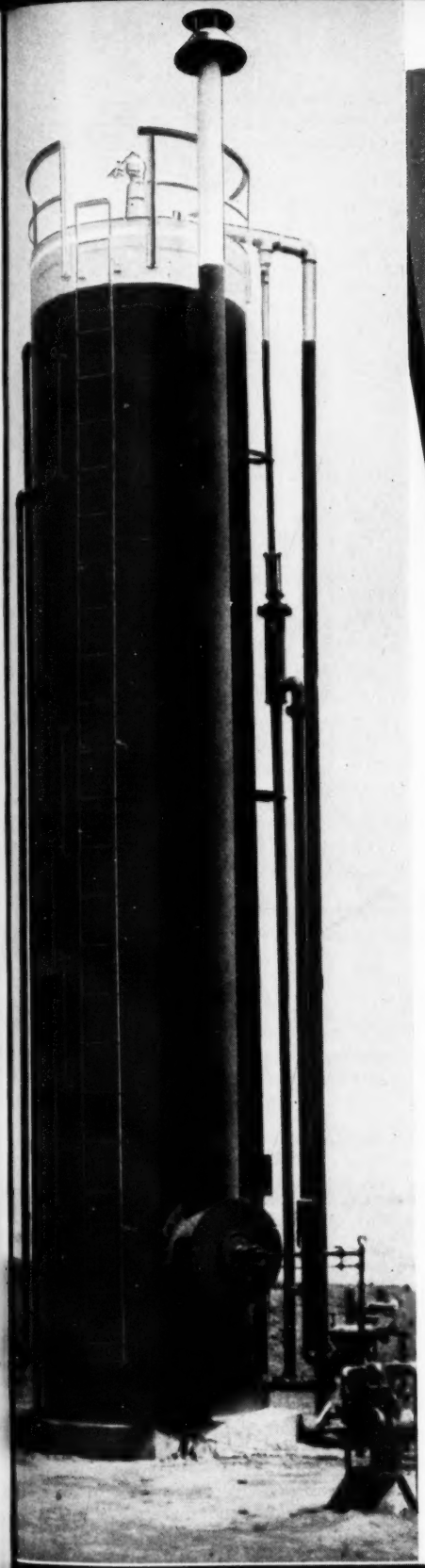

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(Continued from page 77)

trade mark and the trade mark and name of the oil to be placed in the container are stenciled on the top head. Schedules show the number of containers and the sizes going to fill each order, also the grand totals for the schedules. One operator selects the stencils required by the full schedule in each case. Another operator arranges the containers on the floor in the proper sizes and numbers for each grade of oil. The paint-gun operators place the red star, green T, and black lettering on each. The stenciled containers are transferred, by schedule, to the weighing machines to be weighed empty, then pass down to the barrel-filling room. Here they are handled according to the conveyer on which they are to be filled, those on No. 1 going first, and on down to No. 21 last.

Barrel-Filling Room

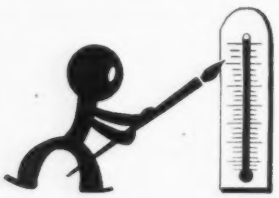
Operated by a staff of 70 to 80 men working on a three-shift, 5-day week, the barrel house includes, on the first floor of the building, 21 gravity-filling conveyors, power conveyors, deflectors, four master scale lines, 65 gravity-storage conveyors, a dehydrating press, portable scales, and strainers. Eight to 12 filling connections are on each of the 21 conveyors, for different grades of oil. Each container received in this huge room is stenciled, weighed, checked, and readied for filling, which normally occurs within 2½ to 3 hours after the drum has entered the building. The filler operator checks the inside of the drum for possible contamination, checks the tag on the filler line with the product called for on the drum stencil, fills the drum, and stamps his initials, batch number, where filled, and month, day, and year. A special operator double checks each step in the process of filling, and the operator records the various identifying items of information on his filling report, which is also approved by the special operator on the report. The container is plugged and a cap or wire seal is installed, then transferred to master scales where it is tilted to horizontal and weighed. The plug is tested for absence of leakage, and the content of the drum in gallons is stamped on the head.

Then follows the segregation of items in each order for shipment, assembling each order separately. These are sent to conveyors for storage until loaded. All grades of oil, up to 300 S.U.v., are strained through 100-mesh screen, while transformer and similar oils which must meet dielectric-strength specifications are passed through a dehydrating press. The storage tanks are tested by the compounding department and tagged to make sure of their contents; these tanks are O.K.'ed to the filling room and each time more oil is pumped into them they are again tested.

Case Filling

Services of 130 to 140 men are required, working three shifts and 5-day weeks, to handle the case-filling section of the plant. Six pumps; 12-filler Crandall filling units; power and hand crimping machines; conveyors; nailers; two 1-qt. filling, sealing and casing lines; one 5-qt. filling, sealing, and casing line are all used for motor oil. All cans are stenciled, filled, and cased within this single department, following the same general plan described above. All cans are filled according to schedule, each of which contains eight or nine carloads, with the exception of the 5-gal. pails of Texaco and Havoline motor oils which are filled and stored to meet the demand there.

As to motor oil, the cans and cases are filled and loaded on pallets (small portable platforms) and delivered by gasoline - electric trucks directly to box cars spotted at the building. One hour from the time an empty quart can is unloaded from the box car which takes it to the case-filling de-



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Magneto Ignition Applications: Sounds an alarm only . . . grounds single or dual magneto . . . grounds magneto and sounds an alarm or lights a signal light.

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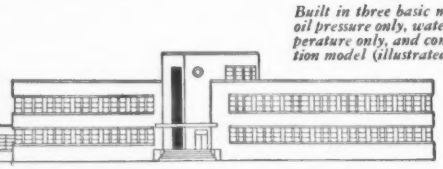

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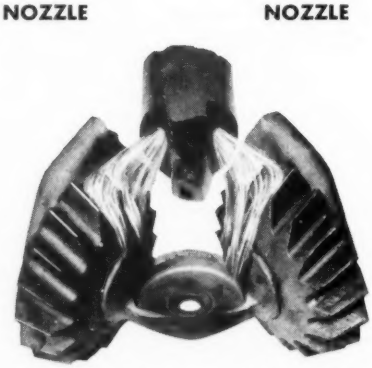

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partment, it is filled, sealed, and placed in a case and loaded into another box car. In short, it is a 1-hour cycle.

Empty 1 and 5-qt. cans are received in box cars from the case and package division. The 1-qt. cans are loaded in bulk in the cars and upon arrival are fed into portable runs which deliver them to can elevators and wire-cable conveyors, which move them directly to filling machines.

Oil is supplied to filling units by pump pressure direct to the reservoir on the filling machine. One-quart cars are filled at the rate of 185 per minute. The filled can travels from the filler via turntables into the sealing machine where embossing of lid, placing on can, and sealing are fully automatic. Next, each can is taken by an elevator belt into the casing unit, where a layer of 12 cans discharges into the paper-board case; the second layer is likewise added. The full case travels by conveyor into automatic gluing equipment. The case then spends 1 minute going through a compression unit and emerges tightly sealed. A stenciling machine applies the S.A.E. number, batch number, month, day, and year filled to both ends of the case. The case then is discharged onto gravity rollers from which it is loaded on pallets, 40 cases to a pallet, which are delivered to a box car.

Filling machinery on the 1 and 5-qt. fillers is controlled by a solenoid switch connected with an oil float to prevent reservoir from running empty without operator's knowledge. Samples are obtained and tested from the first and tenth packages filled to be certain oil is within specifications.

The Crandall unit is adjusted to fill various size cases by weight. Empty packages are removed from storage on the second and third floors of the barrel-house building and transferred to fillers by a lowerator belt. The can is placed under the filling nozzle, filled to predetermined weight, and the filler automatically shuts off. The can is conveyed to the crimping machine for sealing, then over a testing line to be observed for leaks, and then to the case packer.

Five-gallon 25 and 35-lb. pails are handled in the same manner, except they are diverted away from the crimping machine to a gravity roller-conveyor line, where caps are applied and the grade and batch number stenciled on the package top, then loaded in cars or storage.

Loading Department

It takes 150 to 170 men working three shifts and 5 days a week to handle loading operations. They load out approximately 4,800 drums and 23,000 cases daily in from 45 to 50 cars. The first floor of the C. and C. building is the loading department, and a scene of considerable efficiency, where everything moves toward the loading platform and the box cars.

All cases on each order generally are loaded into cars first at the barrel-house loading platform. The motor-oil cases (1 and 5-qt. cans) are run according to the number of each grade needed on the entire schedule (eight or nine orders). While the motor-oil cases are being run on the filling machinery, the other cases of miscellaneous lubricating oil and grease are assembled from various storage rooms, on pallets, as called for on each order. These items then are delivered by the gasoline-electric trucks to proper cars, unloaded, and checked.

Loading of miscellaneous cases must be completed in the cars spotted by the time the machines finish the specified amounts of grades of motor oils, so that a new string of box cars may be switched in for the next schedule. Careful timing and close coordination are required.

After the cars have been partly loaded with cases, they are braced, switched out, and spotted at the loading piers at the C. and C. building where 100-lb. grease drums are loaded and braced.

The drums of lubricating oils then are transferred by conveyors to each car. Drums of grease and wax, filled in other sections of the Port Arthur plant, are timed to appear for loading

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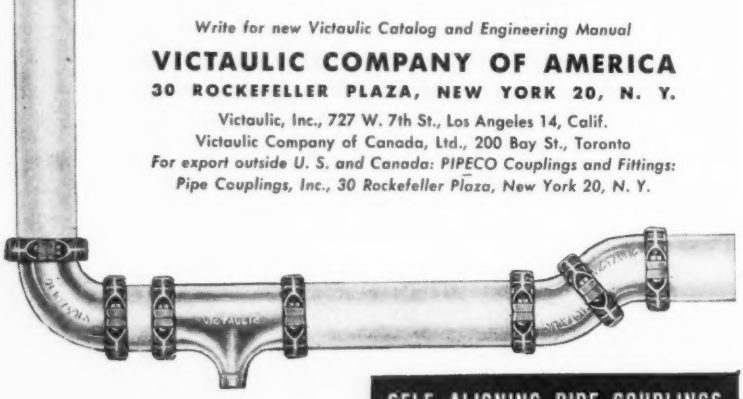

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A power machine which double decks drums in box cars is one of the expediting facilities of the department. Power conveyors, drum loaders equipped with deflectors set at an angle to deflect drums from the conveyor to a box car, and gasoline-electric trucks also are part of the equipment which speeds loading. Inspection of packages before loading and proper bracing in the cars are important duties of the loading force. Loaded cars are listed out of yard to the proper initial carrier. All orders are loaded in accordance with schedules issued by the main shipping office which are prepared 72 hours in advance.

The schedule lists pertinent information opposite each order, such as order number, route, number of drums on order, and miscellaneous cases, pails, motor-oil cases, etc. Schedules are numbered consecutively each month, starting with the numeral 1. Each schedule shows how many box cars will be needed and the proper number is ordered from the railroads for a 24-hour period.

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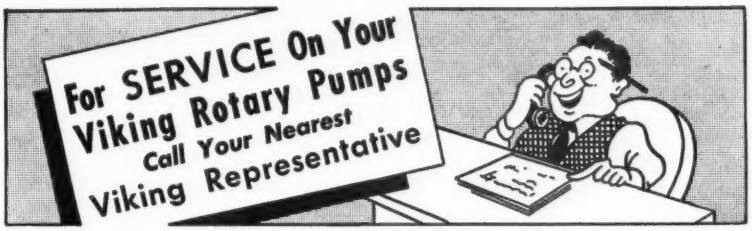

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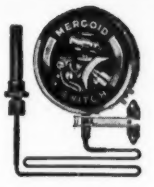

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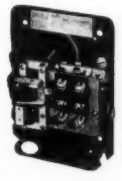
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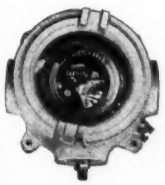
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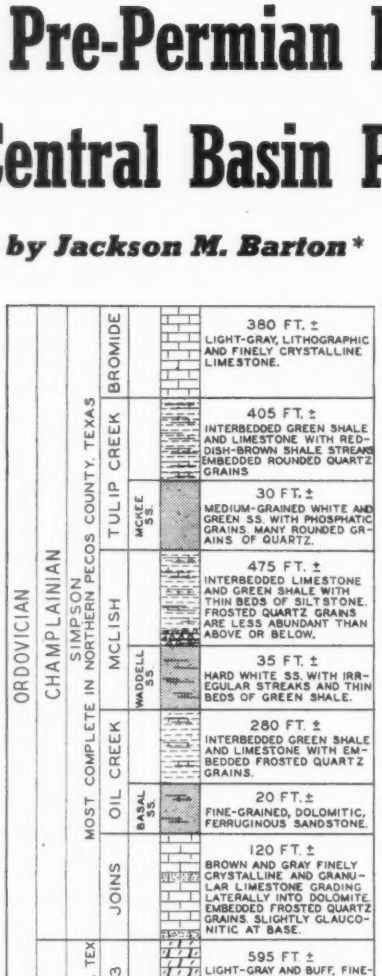
Geological Group Develops Columnar Section of Pre-Permian Formations Along Central Basin Platform

*by Jackson M. Barton**

SYSTEM
SERIES
GROUP
FORMATION
MEMBER
SYMBOL
DESCRIPTION
ORDOVICIAN
CINCINNATIAN
SILURIAN
DEVONIAN
PENNA
MISSISSIPPIAN
P.
HUNTON
MONTOYA
LOWER HUNTON
MIDDLE HUNTON
UPPER HUNTON
MISS. LIMESTONE
WOODFORD SHALE
UNIT 1
UNIT 2
UNIT 3
UNIT 4
UNIT 5
UNIT 6
2500 FT. ± SOME WELLS HAVE PENETRATED MORE THAN 2300FT. OF PENNSYLVANIAN LIMESTONE AND SHALE. FUSULINIDS OF VIRGIL (CISCO), MISSOURI (CANYON), DES MOINES (STRAWN), AND ATOKA (BEND) AGES HAVE BEEN IDENTIFIED.
700 FT. ± BROWNISH-GRAY AND BROWN, SILTY, SILICEOUS, CHERTY, VERY FINELY CRYSTALLINE LIMESTONE.
GENERALLY GLAUCONITIC AT BASE
600 FT. ± BROWNISH-BLACK FLAKY SHALE WITH THIN BEDS OF FINELY CRYSTALLINE, ARGILLACEOUS DOLOMITE AND BROWNISH-BLACK CHERT. CONTAINS CONODONTS AND RESINOUS SPORES.
GENERALLY CONGLOMERATIC PYRITIC, AND GLAUCONITIC AT BASE.
200 FT. ± CREAM, CRYSTALLINE LIMESTONE WITH WHITE TRIPOLITIC CHERT
400 FT. ± CREAM, CRYSTALLINE, SLIGHTLY SILICEOUS LIMESTONE
200 FT. ± WHITE TRIPOLITIC SLIGHTLY CALCAREOUS CHERT
320 FT. ± GREENISH-GRAY, SILICEOUS LIMESTONE WITH BROWN VITREOUS CHERT. OFTEN 20 TO 40 FEET DARK BROWN SPORE-BEARING SHALE IS FOUND AT BASE.
220 FT. ± GREEN, GRAY, AND RED SILTY SHALE WITH SHALY, FINELY CRYSTALLINE LIMESTONE.
450 FT ± PREDOMINANTLY MEDIUM- TO COARSELY CRYSTALLINE LIMESTONE WITH TRACE OF BLUISH-WHITE, OPAQUE AND TRANSLUCENT CHERT.
455 FT. ± GRAY AND BROWN, FINELY CRYSTALLINE LIMESTONE WITH MOTTLED, GRAY AND BROWN, VITREOUS CHERT.
30 FT. ± GRAY AND BROWN, FINELY CRYSTALLINE, LIMESTONE WITH MOTTLED, GRAY AND BROWN, VITREOUS CHERT WITH EMBEDDED, MEDIUM-SIZE SAND GRAINS.


ORDOVICIAN
CHAMPLAINIAN
CANADIAN
CAMBRIAN
PRE-CAMBRIAN
SIMPSON
MOST COMPLETE IN NORTHERN PECOS COUNTY, TEXAS
ELLENBURGER
MOST COMPLETE IN SOUTHERN CRANE COUNTY, TEX
BROMIDE
TULIP CREEK
MCKEE SS.
MCLISH
WADDELL SS.
OIL CREEK
BASAL SS.
JOINS
UNIT 3
UNIT 2
BASAL ELLENBURGER SANDSTONE
UNIT 1
CAMBRIAN SANDSTONE
380 FT. ± LIGHT-GRAY, LITHOGRAPHIC AND FINELY CRYSTALLINE LIMESTONE.
405 FT. ± INTERBEDDED GREEN SHALE AND LIMESTONE WITH REDDISH-BROWN SHALE STREAKS EMBEDDED ROUNDED QUARTZ GRAINS
30 FT. ± MEDIUM-GRAINED WHITE AND GREEN SS. WITH PHOSPHATIC GRAINS. MANY ROUNDED GRAINS OF QUARTZ.
475 FT. ± INTERBEDDED LIMESTONE AND GREEN SHALE WITH THIN BEDS OF SILTSTONE. FROSTED QUARTZ GRAINS ARE LESS ABUNDANT THAN ABOVE OR BELOW.
35 FT. ± HARD WHITE SS. WITH IRREGULAR STREAKS AND THIN BEDS OF GREEN SHALE.
280 FT. ± INTERBEDDED GREEN SHALE AND LIMESTONE WITH EMBEDDED FROSTED QUARTZ GRAINS.
20 FT. ± FINE-GRAINED, DOLOMITIC, FERRUGINOUS SANDSTONE.
120 FT. ± BROWN AND GRAY FINELY CRYSTALLINE AND GRANULAR LIMESTONE GRADING LATERALLY INTO DOLOMITE. EMBEDDED FROSTED QUARTZ GRAINS. SLIGHTLY GLAUCONITIC AT BASE.
595 FT ± LIGHT-GRAY AND BUFF, FINE- TO MEDIUM-CRYSTALLINE DOLOMITE, LOCALLY GREEN AND SHALY WITH A SANDY BED AT BASE. GRADES UPWARD INTO FINELY CRYSTALLINE AND LITHOGRAPHIC DOLOMITIC LIMESTONE.
640 FT. ± BUFF AND LIGHT-BROWN MEDIUM-TO COARSELY CRYSTALLINE SILICEOUS DOLOMITE WITH SOME BEDDED CHERT AND PROMINENT SILICEOUS BEDS OF OOLITE.
90 FT. ± SANDSTONE AND SANDY DOLOMITE CONTAINING LARGE, ROUNDED, FROSTED, QUARTZ GRAINS.
25 FT ± GLAUCONITIC SANDSTONE APPEARS TO BE OLDER THAN ELLENBURGER. OCCURS, E.G. STANOLIND 1 CONRY-DAVIS, PECOS COUNTY, TEXAS.
SINCE THE OLDEST FOSSILS FOUND IN TEXAS AND NEW MEXICO ARE UPPER CAMBRIAN IN AGE, IT IS POSSIBLE BUT NOT PROBABLE THAT THE AGE OF SOME OF THE BASEMENT ROCKS IS MIDDLE OR LOWER CAMBRIAN. THE PRE-CAMBRIAN ROCK IS GRANITE IN MANY PLACES, BUT THIS BASEMENT COMPLEX CONTAINS ACID TO BASIC, COARSE-TO FINE-GRAINED IGNEOUS ROCKS AS WELL AS METAIGNEOUS AND METASEDIMENTARY ROCKS. IT IS REGRETTABLE THAT GRANITE IS OFTEN USED AS A SYNONYM FOR PRE-CAMBRIAN.

WITH the rapid increase in Pre-Permian production in West Texas it became increasingly important to develop as far as possible, complete agreement as to what lithologic and paleontological units of Pre-Permian were present along the Central Basin Platform, and to record a columnar section uniformly useful by geologists, and also by scouts, drilling contractors, and other nongeological personnel. A study group of the West Texas Geological Society has been working on this problem for more than a year and a half, and the group's conclusions are given here. The columnar section accompanying this article, on a vertical scale of 100 ft. to the inch, is being sold for $1 by the West Texas Geological Society.

SINCE March 30, 1945, the Pre-Permian study group of the West Texas Geological Society has been working to develop a columnar section of the Pre-Permian formations along the Central Basin Platform which would be agreeable to and usable by the geologists, and also helpful to nongeological personnel, whose work required the reporting or use of such geological terms.

The stratigraphic units decided upon by the study group will be discussed briefly. No lithological description will be given in the text as this information is shown directly on the columnar section.

Pre-Cambrian

Ronald K. DeFord, with the assistance of Hugh Tanner, led the discussion of the Pre-Cambrian rocks. He pointed out that the oldest fossils that have been found along the Central Basin Platform are upper Cambrian in age. Therefore, the rocks of the basement complex may be Middle or Lower Cambrian in age as well as Pre-Cambrian.

He also called attention to the fact that basic igneous rocks and metamorphosed sediments, as well as granite, are found in the basement

*Chairman, Pre-Permian study group, West Texas Geological Society.

complex. We should not use "granite" and Pre-Cambrian synonymously.

Basal Ellenburger and "Cambrian" Sandstone

John Paul Gries led the discussion of the basal Ellenburger and "Cambrian" sandstone. The group recognized that there may be two distinct sandstone units. The lower one of these, the "Cambrian" sandstone, may or may not be present. Probably it is present only in depressions on the old Pre-Cambrian erosion surface. Above this Cambrian sandstone is the sandy dolomite and dolomitic sandstone of the Ellenburger sandstone member. If the lower part of the Ellenburger group is Cambrian in age, then this latter member is Cambrian sandstone also. If the Ellenburger dolomite is all Ordovician in age, then the basal Ellenburger sandstone is Ordovician in age.

Ellenburger Group

The Ellenburger group was discussed by E. W. Vanderpool and A. L. Repecka. The occurrences of the Ellenburger group in West Texas were reported by W. J. Hilseweck. The members decided to apply the term Ellenburger group to all rocks between the Simpson group and the basement complex. It was realized that if the lower part of this interval is Cambrian in age then this usage is not in keeping with the recent restriction of the term "Ellenburger" by the U. S. Geological Survey and the University of Texas.* As it is not known whether any of these rocks are Cambrian or not and as there is no strong lithologic break, it was decided to use the term "Ellenburger" to include all this section. The Ellenburger group was divided into three units that were ranked as formations.

Simpson Group and Montoya Formation

R. V. Hollingsworth discussed the Simpson group of Oklahoma as a preliminary to the discussion of the same group of West Texas. Jackson M. Barton led the discussion of the Simpson group and Montoya formation of West Texas.

The Simpson group was divided into five formations that are, in ascending order: Joins, Oil Creek, McLish, Tulip Creek, and Bromide. Some geologists in the study group disagreed with this division. They feel that the Tulip Creek formation is a shale facies of the Bromide formation and they would do away with the term "Tulip Creek" as a formation name. This may be the correct interpretation but since the term Tulip Creek is used so much and with a considerable amount of uniformity it was decided to give it the full formation ranking.

The Joins formation is thought by some members of the study group to be a limestone or dolomite facies of the Oil Creek formation and not a definite formation in itself. Here again, it was decided to recognize the Joins as a formation on the columnar section because it is used so universally by geologists in the region.

The Tulip Creek formation has a basal member named the McKee sandstone and the McLish formation has a basal member called the Waddell sandstone.

The Montoya formation is recognized by all geologists working in West Texas and there was little discussion concerning it.

Mississippian and Devonian Systems of Areas Surrounding West Texas

Ronald K. Deford discussed the Mississippian and Devonian systems of areas surrounding West Texas as a preliminary to discussion of these systems as found along the Central Basin Platform.

Hunton Group

Theodore S. Jones led the discussion of the Hunton group. The Hunton group comprises those rocks of the Devonian and Silurian systems. It was divided into three parts; Lower, Middle, and Upper Hunton and these were given formation ranks. The Hunton group was then further divided into units that were given the rank of members. The Lower Hunton consists of Unit 1; the Middle Hunton consists of Units 2 and 3; and the Upper Hunton consists of Units 4, 5, and 6.

The term Hunton group was proposed because of the uncertainty concerning what portion of these rocks belongs to the Silurian system and what portion belongs to the Devonian system. The term as used in Oklahoma, at the type locality, includes beds of both the Devonian and Silurian systems. So, it was felt that the term would be good in that it indicated the existence of the same enigma in West Texas as exists in dealing with the Oklahoma section.

Some of the members of the study group cast a dissenting vote regarding the usage of the term. This was based on the fact that it is not known whether the same portions of the Devonian and Silurian systems are present in West Texas as in Oklahoma.

A large majority felt that to use a term such as Hunton group was preferable to the continued reference to the "top of the Silurian" while there is such a varied opinion as to the position of this "top." Some geologists call the top of the Silurian at the top of Unit 1, some at the top of Unit 2, and some at the top of Unit 3.

Woodford Shale and "Mississippian" Limestone

Samuel P. Ellison led the discussion of the Mississippian limestone and the Woodford shale.

The term Woodford was borrowed from the Oklahoma section. It has been in use in West Texas for 4 or 5 years and there is as yet no reason to abandon it.

The Woodford shale is one of the most readily recognizable lithologic units of West Texas and has been a very great help in deciphering the Pre-Permian stratigraphy.

The question exists as to whether it belongs in the Devonian system or in the Mississippian system. Here no attempt was made to establish definitely the age of the Woodford shale.

Overlying the Woodford shale is a limestone formation that is here called Mississippian limestone for want of a better name.

It is not certain what part of the Mississippian system is represented by the formation. Thus the reticence to use any formation names that are established at the outcrops.

Pennsylvanian System

We have been unable to determine the maximum thickness of the Pennsylvanian system along the Central Basin Platform because of the limited number of wells that have encountered Pennsylvanian rocks.

Fusulinids from all four series of the Pennsylvanian have been found but we were unable to arrive at a thickness to assign to these units.

West Texas Geological Society Pre-Permian Study Group

Jackson M. Barton, Magnolia Petroleum Co., chairman.
Leslie T. Brown, Pure Oil Co.
Ronald K. DeFord, Argo Oil Corp.
Samuel P. Ellison, Stanolind Oil & Gas Co.
John P. Gries, Magnolia Petroleum Co.
William J. Hilseweck, Gulf Oil Corp.
R. V. Hollingsworth, Paleontological Laboratory.
Theodore S. Jones, Humble Oil & Refining Co.
Frank E. Lewis, Great Lakes Carbon Corp.
E. Russell Lloyd, consulting geologist.
P. D. Moore, consulting geologist.
Karl A. Mygdal, Pure Oil Co.
Victor E. Peterson, Magnolia Petroleum Co.
George D. Putnam, Lario Oil & Gas Co.
Bernard A. Ray, consulting geologist.
A. L. Repecka, Superior Oil Co.
Clark P. Steinberger, Skelly Oil Co.
Hugh Tanner, The Ohio Oil Co.
E. W. Vanderpool, Stanolind Oil & Gas Co.
W. A. Waldschmidt, Argo Oil Corp.
Harold L. Williams, Paleontological Laboratory.
Addison Young, consulting geologist.

*Cloud, P. E., Jr., Barnes, V. E. and Bridge, Josiah, "Stratigraphy of the Ellenburger Group in Central Texas—a Progress Report," University of Texas Publication 4301, 1945, pp. 133-177.

Equivalent Well Systems

*by Park J. Jones**

OIL PRODUCTION by water

PART 7 OF A SERIES

A STATISTICAL approach to estimating the producing capacity of any number of wells is desirable from the viewpoint of the number of wells alone. In addition, statistical procedures are indicated by the many factors influencing well capacity. The approach here suggested is based on equivalent one, two and three-row well systems. The application of average completion in pay, average permeability, and average drawdown to the wells on a first row is an approximation to actual values. Similarly, the application of interference factors is an approximation, depending on judgment whether a given group of wells constitutes a one, two or three-row equivalent well system.

Linear Rows vs. Radial Rows

FIG. 7-1 shows three rows of wells for an elongated reservoir. The first row has 40 wells. Rows 2 and 3 combined have 37 wells. The ratio of wells updip from Row 1 to the wells on Row 1 is 37:40 or less than unity. The ratio of wells for a two-row linear system is 1:1. We would say that the system shown in Fig. 7-1 is equivalent to a two-row linear system. The estimated per-well average capacity is 0.6 (64) or 38.4 per cent of Q_w the capacity of an average well on Row 1 aside from interference. The total estimated well capacity for the system is 77 (0.384) Q_w or 29.5 Q_w.

Consider regular and staggered well locations on a circular reservoir. Figs. 7-2 and 7-3 show the corresponding number of wells. Let there be r rows. The last row is on the apex and is a one-well row. The first row contains $6(r-1)$ wells for staggered spacing or $8(r-1)$ wells if spacing be regular. The ratio of updip wells to the wells in the first row is 1:1 for a four-row radial system. We would say that a four-row radial system is equivalent to a two-row linear system. A six-row radial system having either staggered or regularly-spaced wells is equivalent to a three-row linear system. The corresponding average per-well capacity is $1.23 \times (0.64)/3$ or 26.2 per cent of Q_w where Q_w is the capacity of an average well on the first row aside from interference.

A six-row radial system has 91 staggered wells or 121 regularly spaced wells. If more than 91 or 121 producing wells are drilled, the per-well capacity aside from changes in Q_w is 91/N or 121/N times 0.262 Q_w when N is the total number of wells.

*Production consultant. Houston.

The Interference Factor

The producing capacity Q_w of an average well on Row 1 varies inversely with log d/2r where d is the average distance from Row 1 to an advancing oil-water interface. Accordingly, Q_w increases with the number of wells on a radial reservoir provided other things are equal aside from distance to water. In addition, Q_w may increase with time. Finally, Q_w is higher for a given number of regularly spaced wells than for the same number of staggered wells.

The above considerations are summarized in Table 7-1. The data are tentative and subject to revision. For elongated reservoirs, use the linear or radial interference factor which more nearly approximates the elongated system. The symbol Q_w is the producing capacity of an average well on Row 1 aside from interference. The number of wells in Table 7-1 for radial reservoirs is relative to a 360° central angle. For other central angles, the number of wells is proportional to the central angle of radial reservoirs.

TABLE 7-1—TENTATIVE INTERFERENCE FACTORS*

Linear reservoir	Radial reservoirs—No. of wells: Regular	Staggered	Interference factor, I, % of Q_w
$n \geq 5$	9	7	64.0
2n	49	37	38.4
3n	121	91	26.2
Xn	...	...	78.7/X
...	N > 121	...	26.2(121)/N
...	...	N > 91	26.2(91)/N

*Subject to revision.

Control of Producing Rates

Most reservoirs have two, or more, producing intervals separated by thin impermeable breaks. The per-interval rate of production Q_i may be proportional to reserve, that is:

$$Q_i \propto [aHf(1 - I)m]_i$$

Let the porosity, interstitial water, and displacement factor be the same for all intervals. Then:

$$Q_i \propto (aH)_i$$

where $(aH)_i$ is the acre-feet of pay for the ith interval. If there are several pay intervals, the rate of production from the ith interval to that from all intervals Q may be:

$$\frac{Q_i}{Q} = \frac{(aH)_i}{\Sigma (aH)_i}$$

Let I_i be the interference factor for the wells completed in the ith interval and n_i, the relative number of well completions in the ith interval. The rate of production from the ith interval is proportional to the following factors:

$$Q_i \propto (InhK\Delta P)_i$$

For the total rate of production, we have:

$$Q \propto \Sigma (InhK\Delta P)_i$$

Hence,

$$\frac{(InhK\Delta P)_i}{\Sigma (InhK\Delta P)_i} = \frac{(aH)_i}{\Sigma (aH)_i} \quad (1)$$

The factor h is the average completion in pay for wells. Whereas, H is the average pay thickness for "a" acres. If h = H, the pay thickness factors need not be included. If the productive area "a" is the same for all intervals, it need not be included. Suppose the pressure drawdown ΔP is also uniform for all intervals. For these conditions, we have:

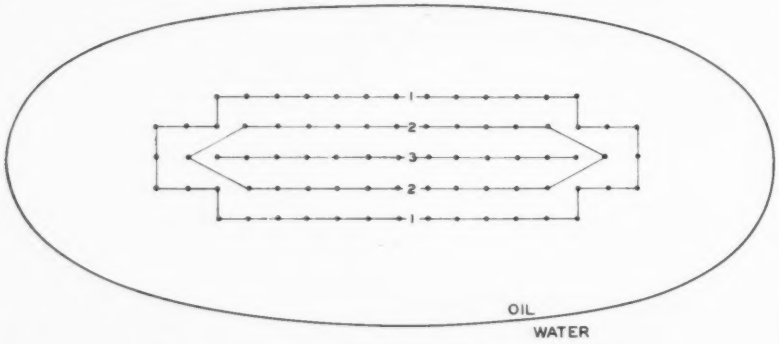
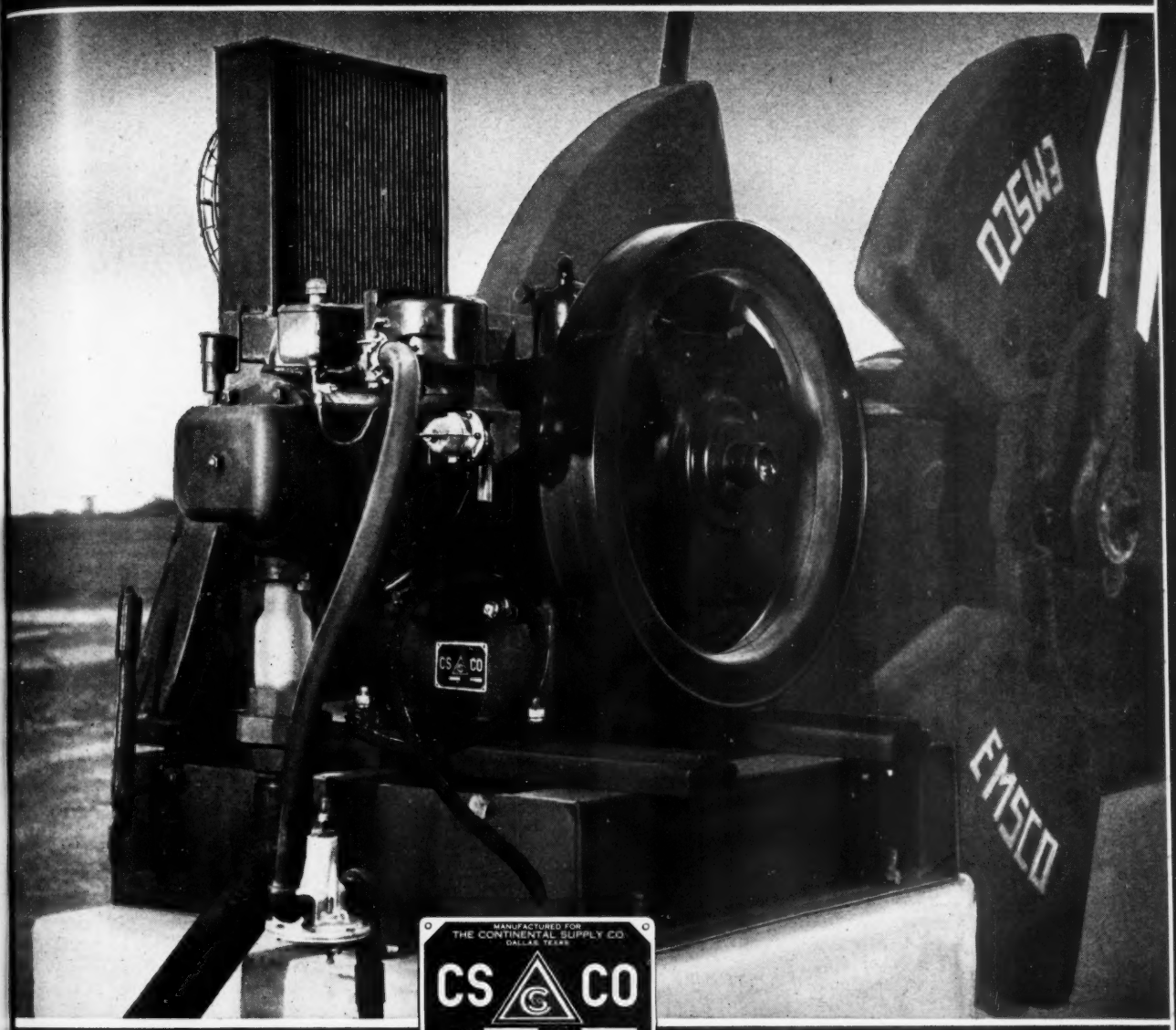


Fig. 7-1—Three rows of wells on an elongated reservoir Row 1, 40 wells; Row 2, 24 wells; Row 3, 13 wells



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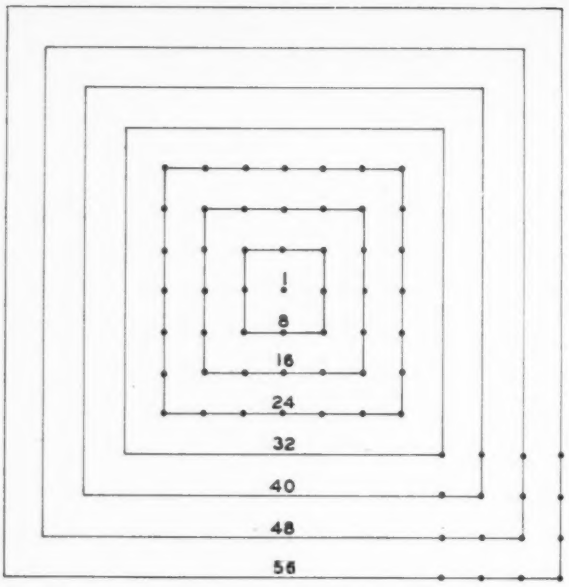

Fig. 7-2—Number of wells per row for regular spacing on radial reservoirs

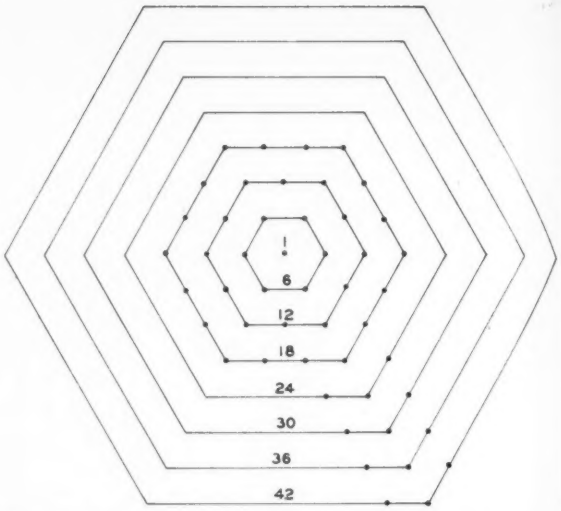

Fig. 7-3—Number of wells per row for staggered spacing on radial reservoirs

$$N_i = N \frac{\frac{\Sigma (IK)_i}{(IK)_i}}{\Sigma \left[\frac{\Sigma (IK)_i}{(IK)_i}\right]} \quad (2)$$

where N is the total number of well completions for all intervals and N_i is the number of completions in the ith interval.

Example 1.—One hundred wells penetrate three pay intervals having the following permeabilities: 200, 400, and 800 md. respectively. Estimate the most advantageous completions for (1) producing rates proportional to reserve, (2) uniform pressures at water contact, (3) uniform bottom-hole operating pressures, (4) uniform per-interval pay thickness, and (5) productive area is the same for all intervals.

Solution by Equation 2. First neglect the interference factor so that:

$$N_i = N \frac{\frac{\Sigma K_i}{K_i}}{\Sigma \left(\frac{\Sigma K_i}{K_i}\right)}$$

Interval No.—	1	2	3
Permeability	800	400	200
Relative completions	1.75	3.5	7
Number of single completions	14	29	57
With dual completions	25	50	100

For single completions, 57 wells would go to the least permeable interval. If production were isolated by intervals, there would be 25 single completions in the least permeable interval and 75 dual completions. Intervals 1 and 3 would have 25 dual completions. Intervals 2 and 3 would have 50 dual completions.

Equation 2 will now be applied on the assumptions that the completions are equivalent to one, two, and three-row systems.

Interval	1	2	3
K_i	800	400	200
I_i	0.64	0.384	0.262
$(IK)_i$	512	153.6	52.4
Relative completions	1.40	4.67	13.7
Number of single completions	7	24	69
With dual completions	10	35	100

One hundred wells would be completed in Interval 3. Of these, 35 would be dual completions for Interval 2 and 10 for Interval 1. For single completions, only 7 wells would be completed in the first interval as compared to 69 wells in the third interval. Interference between wells in the present example increases the number of single completions from 57 to 69 in the third interval. In the first interval, interference reduces the number of single completions from 14 down to 7. The control of producing rates is here by number of wells only.

Control With Pressure Drawdown

A variable pressure drawdown as between two, or more, pay intervals may be applied advantageously under some conditions. Control of per-interval producing rates may be by some combination of the number of producing wells and pressure drawdown. Let the influence of productive area and pay thickness on the required producing rates be negligible. Under these conditions, the relative per-interval completion n_i are defined by:

$$n_i = \frac{\Sigma (IK\Delta P)_i}{(IK\Delta P)_i}$$

where ΔP_i is the per-interval pressure drawdown and n_i is the relative number of completions. When the total number of completions is N, the number of completions for the ith interval is given by:

$$N_i = N \frac{\frac{\Sigma (IK\Delta P)_i}{(IK\Delta P)_i}}{\Sigma \left[\frac{\Sigma (IK\Delta P)_i}{(IK\Delta P)_i}\right]} \quad (3)$$

Example 2.—Intervals 1 and 2 of Example 1 are to be flowed and Interval 3 is to be pumped. Estimate the required completions for a 200-psi. flowing drawdown and a 1,000-psi. pumping drawdown. Aside from the interference factor:

$$n_i = \frac{\Sigma (K\Delta P)_i}{(K\Delta P)_i}$$

Interval	1	2	3
K_i	800	400	200
ΔP_i	200	200	1,000
$(K\Delta P)_i/1,000$	160	80	200
Relative completions	2.75	5.5	2.2
Number of single completions	26	53	21
With dual completions	50	100	40

Equation 3 will now be applied on the assumption that the completions constitute two and three-row systems.

Interval	1	2	3
K_i	800	400	200
ΔP_i	200	200	1,000
I_i	0.384	0.262	0.384
$(IK\Delta P)_i/1,000$	61.4	21.0	76.8
Relative completions	2.59	7.58	2.07
Number of single completions	21	62	17
With dual completions	34	100	27

Of the 100 wells, 17 would be completed as pumping wells, 62 would go to the second interval and 34 to

the first interval. However, if dual pumping-flowing completions were used, all wells would be completed in the second interval. Of these, 27 would be dual pumping-flowing wells and 34 dual flowing. If the flowing production need not be isolated, 34 wells would be completed in both of the first two intervals.

Control of per-interval rates is here by number of wells and drawdown. The control is in terms of no reduction in effective permeability relative to the 1,000-psi. drawdown. The bottom-hole pumping pressure is not less than the saturation pressure for oil.

Relative Permeability

A reduction in pressure below the saturation pressure for an oil causes evolution of gas. The presence of free gas reduces the effective permeability to oil. The curves in Fig. 7-4 show the approximate relationship between

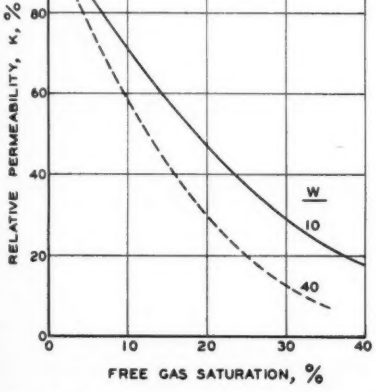

Fig. 7-4—Approximate relative permeability vs. free-gas saturation for 10 and 40 per cent interstitial water

effective permeability and free-gas saturation. The effective permeability of a reservoir-well system is 100 per cent at, and above, saturation pressure. At a pressure which is 75-85 per cent of saturation pressure, the free-gas saturation is on the order 10 per cent of porosity. The corresponding relative permeability is 60-70 per cent of the permeability at no free-gas saturation. At 20 per cent free-gas saturation, the relative permeability to oil is about 40 per cent.

Well capacities are influenced significantly by relative permeability. Consequently, the permeability of pay intervals should be corrected for the influence of free gas. A reservoir pressure may be above saturation pressure while a bottom-hole operating pressure may be substantially below the saturation pressure. But, when free gas is present in the vicinity of a well bore, the pressure drop within 50 ft. of such a well may be 90 per cent of the total drawdown. Therefore, the permeability in the vicinity of a well should be applied, with corrections for reservoir permeability if desired.

Example 3.—Intervals 1 and 2 of Example 1 are to be flowed and Interval 3 is to be pumped. Estimate the required number of completions for a 200-psi. flowing drawdown and a 1,000-psi. pumping drawdown. The latter reduces the effective permeability 50 per cent. In this instance we have the following conditions aside from interference:

Interval	1	2	3
K_i	800	400	100
ΔP_i	200	200	1,000
$(K\Delta P)_i/1{,}000$	160	80	100
Relative completions	2.13	4.25	3.40
Number of single completions	22	43	35
With triple completions	51	100	81

Equation 3 will now be applied on the assumption that the completions are three-row systems for Intervals 2 and 3 and a two-row system for Interval 1.

Interval	1	2	3
K_i	800	400	100
ΔP_i	200	200	1,000
I_i	0.384	0.262	0.262
$(IK\Delta P)_i/1{,}000$	61.4	21.0	26.2
Relative completions	1.76	5.15	4.13
Number of single completions	16	47	37
With triple completions	34	100	79

The number of pumping wells having single completions is increased from 17 in Example 2 up to 37 for reduction of permeability by free gas. The corresponding increase for dual completions is from 27 up to 79 of which 13 would be triple completions if production were isolated by intervals.

Avoid Carbon Monoxide

(Continued from page 91)

The CO content of automobile exhaust gases is dependent upon several factors including carburetor adjustment, grade of fuel, engine temperature, timing, compression, etc. Nevertheless, even in a perfectly timed and smooth-running motor, it is very dangerous to assume that it will not exhaust carbon monoxide. Students of the toxicity of CO have tested all concentrations and find that poisonous effects not only depend on concentration but also on duration of exposure. A given concentration multiplied by the time of exposure increases the toxic reaction in direct proportion as the exposure time is extended. Also, it should be borne in mind that the quantity of CO absorbed in the blood stream varies with the amount of physical exercise; blood will become saturated with CO about three times faster while engaged in active work than while resting.

As yet the medical profession has found no evidence that there is any chronic or lasting effects to a non-fatal case of CO poisoning. While there has been contention that CO poisoning may be cumulative and chronic, it has not yet been proven. Sievers, Edwards, Murray, Schrenk, and Schroeder have studied and reported that there is no evidence that carbon monoxide will remain in the blood stream or in the system for any considerable period of time.

Any person overcome by carbon monoxide should immediately be removed to fresh air and given artificial respiration.

BOOKS

BUTALASTIC POLYMERS. A TREATISE ON SYNTHETIC RUBBERS. By Frederick Marchionna. Reinhold Publishing Corp., 330 West 42nd Street, New York. 642 pp. $8.50.

Following an introduction in which the author defines synthetic rubber, the book presents a historical chapter, and then presents the main subject matter in three general parts. The first part is devoted to source and production of monomers—isoprene, dimethylbutadiene, and halobutadienes—and their sources. The second part has to do with polymerization, its mechanism and processes. The third deals with processing and industrial applications of butalastics, and their compounding and vulcanization; plastic and fluid butalastics compositions; filming, extruding, coating and laminating; miscellaneous articles; properties of butalastics, and butalastic derivatives.

PETROLEUM PRODUCTION. Vol. II. THE OPTIMUM RATE OF PRODUCTION. By Park J. Jones. Reinhold Publishing Corp., 330 West 42nd Street, New York, 293 pp. $4.50.

This volume deals with the attainment of maximum recovery. Discussed are factors and features associated with maximum and optimum rate of production. More importantly, however, the "how" of doing it so as to obtain correspondingly the greatest profits is explained. The simplified mathematical relations involved, for convenience, are presented in easy-to-read charts. The work represents the most up-to-date material for utilization by production engineers.

CHEMICAL SPECIALTIES. A SYMPOSIUM. Compiled by H. Bennett. Chemical Publishing Co., 26 Court Street, Brooklyn. 826 pp. $12.50.

This book will be of invaluable assistance to all those who intend to prepare their own chemical specialties and to build up a chemical-specialty business. It will teach the rudiments of chemistry to the business man and give the necessary business information to the chemist. Every aspect of the chemical-specialty business is covered. Hundreds of formulas are given for the manufacture of cosmetics, food products, inks, adhesives, textile-finishing agents, products used on the farm, in metallurgy, paper industry, and many other flourishing trades and industries. No chemical background is necessary. The only requirement is to follow the directions which are given in clear and simple style. Valuable information is presented on the determination of the sales possibilities of a product, and how to make it salable and attractive. The machinery and equipment most frequently used are discussed in detail and many illustrations help to explain the operation of the apparatus. Sources of raw materials and equipment, methods of testing, storing, packing and shipping are also described.

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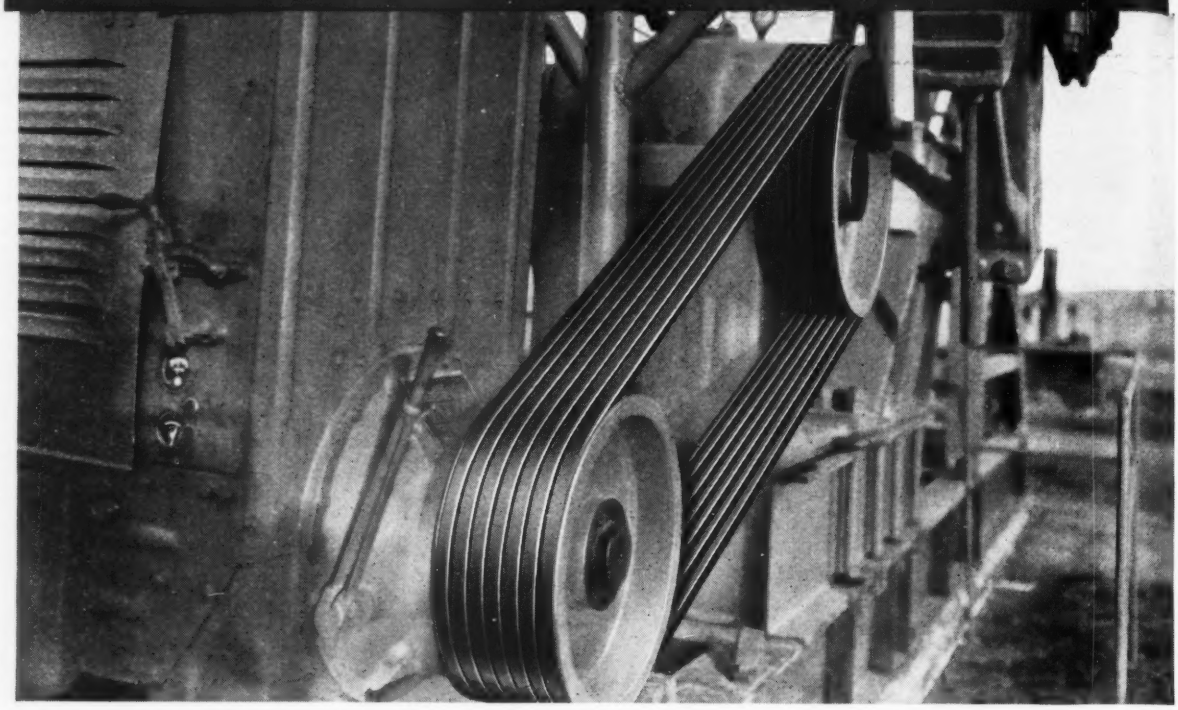

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Weight of Steel Tubing

WEIGHT OF STEEL TUBING

Outside diameter (in.)	Weight—pounds per foot length — Thickness of wall — inches (decimal and fraction) and B.W.G.																
	0.109 12 ga.	.125 1/8	.134 10 ga.	.165 8 ga.	.187 3/16	.250 1/4	.312 5/16	.375 3/8	.437 7/16	.50 1/2	.625 5/8	.75 3/4	.875 7/8	1.0 1	1.125 1 1/8	1.25 1 1/4	1.375 1 3/8	1.50 1 1/2
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1 1/8	1.18	1.33	1.42	1.69	1.88	2.34	2.71	3.00	3.21	....	....	....	....	....	....	....	....	....
1 3/16	1.26	1.42	1.51	1.80	2.00	2.50	2.92	3.25	3.50	3.84	....	....	....	....	....	....	....	....
1 1/4	1.33	1.50	1.60	1.91	2.13	2.67	3.13	3.50	3.80	4.00	....	....	....	....	....	....	....	....
1 5/16	....	1.58	1.69	2.02	2.25	2.84	3.34	3.75	4.08	4.33	....	....	....	....	....	....	....	....
1 3/8	....	1.67	1.78	2.13	2.38	3.00	3.54	4.00	4.38	4.67	....	....	....	....	....	....	....	....
1 7/16	....	1.75	1.86	2.24	2.50	3.17	3.75	4.25	4.67	5.00	....	....	....	....	....	....	....	....
1 1/2	....	....	1.95	2.35	2.63	3.34	3.96	4.51	4.96	5.34	....	....	....	....	....	....	....	....
1 9/16	....	....	2.04	2.46	2.75	3.51	4.17	4.76	5.26	5.67	....	....	....	....	....	....	....	....
1 5/8	....	....	2.13	2.57	2.88	3.67	4.38	5.01	5.55	6.01	6.67	....	....	....	....	....	....	....
1 11/16	....	....	2.22	2.68	3.00	3.84	4.59	5.26	5.84	6.34	7.09	....	....	....	....	....	....	....
1 3/4	....	....	....	2.79	3.13	4.00	4.80	5.51	6.13	6.67	7.50	....	....	....	....	....	....	....
1 13/16	....	....	....	2.90	3.25	4.17	5.01	5.76	6.42	7.01	7.92	....	....	....	....	....	....	....
1 7/8	....	....	....	3.01	3.38	4.34	5.21	6.01	6.72	7.34	8.34	....	....	....	....	....	....	....
1 15/16	....	....	....	3.12	3.50	4.51	5.42	6.26	7.01	7.68	8.76	....	....	....	....	....	....	....
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3 3/4	....	....	....	....	....	9.34	11.47	13.52	15.48	17.36	20.86	24.03	26.87	29.37	....	....	....	....
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4 3/4	....	....	....	....	....	12.02	14.81	17.52	20.15	22.70	27.53	32.04	36.21	40.05	43.56	46.73	....	....
4 7/8	....	....	....	....	....	12.35	15.23	18.02	20.73	23.36	28.37	33.04	37.38	41.39	45.06	48.39	....	....
5	....	....	....	....	....	12.68	15.64	18.52	21.32	24.03	29.20	34.04	38.55	42.72	46.56	50.06	53.23	....
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5 3/8	....	....	....	....	....	13.68	16.90	20.03	23.07	26.03	31.71	37.05	42.05	46.73	51.06	55.07	58.74	....
5 1/2	....	....	....	....	....	14.02	17.31	20.53	23.65	26.70	32.54	38.05	43.22	48.06	52.57	56.74	60.58	....
5 5/8	....	....	....	....	....	14.35	17.73	21.03	24.24	27.37	33.38	39.05	44.39	49.40	54.07	58.41	62.41	....
5 3/4	....	....	....	....	....	14.69	18.15	21.53	24.82	28.04	34.21	40.05	45.56	50.73	55.57	60.08	64.25	....
5 7/8	....	....	....	....	....	15.02	18.57	22.03	25.41	28.70	35.04	41.05	46.73	52.07	57.07	61.74	66.08	....
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6 1/8	....	....	....	....	....	....	19.40	23.03	26.58	30.04	36.71	43.05	49.06	54.74	60.08	65.08	69.75	74.09
6 1/4	....	....	....	....	....	....	19.82	23.53	27.16	30.71	37.55	44.06	50.23	56.07	61.58	66.75	71.59	76.10
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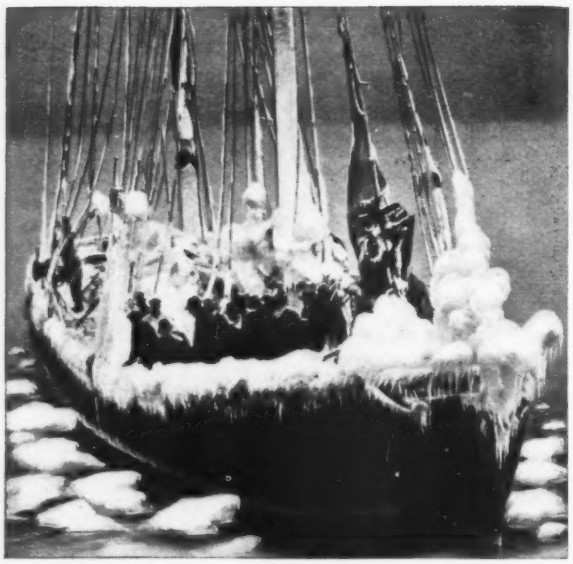
6 1/2	....	....	....	....	....	....	20.65	24.53	28.33	32.04	39.22	46.06	52.57	58.74	64.58	70.09	75.26	80.10
6 3/4	....	....	....	....	....	....	21.47	25.53	29.50	33.38	40.88	48.06	54.90	61.41	67.59	73.43	78.93	84.11
7	....	....	....	....	....	....	22.32	26.53	30.66	34.71	42.55	50.06	57.24	64.08	70.59	76.76	82.60	88.11

No. 123 in a series by W. L. Nelson, professor of petroleum refinery engineering, University of Tulsa



HOW TO KEEP AN ENGINE WARM... ON ICE

YOU KNOW the difficulties in starting an automobile engine on a cold day—what, then, enables this ice-bound fishing vessel's engine to turn over instantly without coaxing, fussing or strain? What magic keeps the engine oil from freezing?

The answer is in a small, compact instrument developed and manufactured for the Government during the war—*exclusively* by Cities Service.

It is the Oil Immersion Heater... so small you could hold it easily with one hand. Inserted into the oil tank of any internal combustion engine and supplied with current from a battery, it operates automatically... circulating and warming the engine oil until the required protective temperature is reached. Then it shuts itself off until the process must again be repeated.

Thus, though the engine is idle—*it is warm*. And a warm engine in cold weather means safety, savings and comfort whether your business or pleasure is fishing, flying or driving.

These amazing little Oil Immersion Heaters are now serving in the efficient cold-weather operation of Diesel locomotives, bulldozers, cranes, tractors, trucks and other outdoor equipment; in Coast Guard vessels, motor boats and fishing fleets.

Helping to make petroleum products work better is reflected in the many patented instruments developed and produced by the 50,000 skilled men and women in the Cities Service family. *Cities Service Oil Co., Sixty Wall Tower, New York; in the South, Arkansas Fuel Oil Co., Shreveport, La.*

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Chlorination of Water

CHLORINATION is a process in which elemental chlorine or relatively unstable chlorine compounds are added to raw or partially treated water. In the great majority of cases, this addition of chlorine or chlorine compounds is for the purpose of destroying harmful bacteria that may be present, and/or for the removal of offensive odors and tastes. Less extensively, chlorination is employed to prevent the formation of slime growths; to oxidize, decolorize and destroy organic matter; in the removal of soluble iron compounds from water; and as an aid in certain coagulation reactions.

Chemistry Involved

Chlorination of water is usually accomplished by direct application of chlorine gas or feed of solutions of calcium or sodium hypochlorite. Chloride of lime (bleaching powder), which is also used, is an impure hypochlorite containing appreciable amounts of lime and other impurities. With any of these chlorinating agents a number of basic reactions will take place upon admixture of the agent with water. These basic reactions may be classified in three groups:

Direct combination of chlorine with organic matter (including some bacteria).

Oxidation of inorganic and (with increasing chlorine concentration) some organic compounds.

Bactericidal action — attack on bacterial organisms.

In the first group are found reactions of chlorine with phenolic compounds, vegetable extracts, certain products in domestic sewage, etc., while the second group includes the oxidation of ferrous iron to ferric iron, hydrogen sulfide to hydrochloric acid, etc.

Concerning the third class of reactions, early theories attributed the destruction of bacteria to "nascent oxygen" set free through the decomposition of hypochlorous acid (HOCl). These theories have since been disproved and the present explanation of bactericidal action is on the basis that chlorine actually attacks the body of the bacterial organism causing rapid death.

Chlorine - ammonia treatment.— About 1929 it was found that the use of ammonia in conjunction with chlorine provided an excellent means of preventing development of chlorinous tastes in water treated with chlorine. This, especially, was found to be the case in chlorination of waters containing phenolic impurities.

In addition to its use in the prevention of development of chlorinous or chlorphenolic tastes and odors, the chlorine-ammonia process yields a treated product which will remain sterile over a prolonged period of time. Chloramine residuals will remain in treated water much longer than will residuals of hypochlorous acid. This long retention of chloramine residuals, incidentally, provides a means of preventing formation of tastes and odors in stagnant sections of water distribution systems.

Chlorine requirements.—The chlorine or hypochlorite dosage required for the complete sterilization of water for the removal of objectionable tastes and odors is an extremely variable quantity entirely dependent upon the nature and quantity of impurities present. Sufficient chlorine must be applied to complete oxidation of inorganic salts and the more readily oxidizable organics and to combine with other organic constituents, before a residual of free chlorine is built up in the water sufficient to cause destruction of bacterial organisms.

Effective sterilization of a water can be assured if sufficient chlorine or hypochlorite is used to insure the presence of a chlorine residual of 0.2 p.p.m. 15 to 20 minutes after contact with the chlorinating agent. Most water supplies will require approximately 0.2 to 1.0 p.p.m. of chlorine to satisfy this requirement.

If elimination of undesirable tastes and odors is also a requirement of the chlorination process, chlorine dosages will usually be somewhat higher than that necessary to effect only bacteriological sterilization. Within the past few years a technique of chlorination to the "breakpoint" has become widely used in connection with taste and odor elimination. The breakpoint is best explained through reference to chart (Fig. 1).

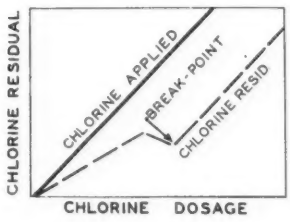

Fig. 1

As the chlorine dosage is gradually increased, the chlorine residual (determined after a fixed period of contact) will also rise; but not at the same rate as the increase in chlorine dosage. Increasing the chlorine dosage still further, a point will be reached beyond which no rise at all in chlorine residual will be experienced, and where frequently, a decrease in residual will occur. This is the breakpoint and is considered to be that point at which the chlorine concentration becomes adequate to cause a breakdown of the structure of many of the taste and odor producing impurities. At this point it will usually be found that tastes and odors will almost completely disappear. Beyond the breakpoint, it will be found the chlorine residual will increase at very nearly the same rate as the increase in chlorine dosage. While all waters do not always show a clearly defined break point, successful applications of this technique have been so numerous as to clearly indicate its definite value.

Equipment Employed

Chlorine gas or solutions of hypochlorites can be very readily and accurately applied to water or sewage by means of constant rate or proportional feeding devices offered by a number of suppliers. For large applications, the use of chlorine gas is preferred both from the standpoint of economy and convenience. In such cases chlorine is accurately fed by chlorinators in quantities proportional to the value of flow. For sterilization of small or temporary water supplies, the use of hypochlorite solutions will sometimes be found more advantageous. In feeding hypochlorite solution, small proportioning chemical pumps may be used for injecting the hypochlorite directly into pipe lines or into reservoir tanks.

This material is from the Betz Handbook for Industrial Water Conditioning, written and published by W. H. and L. D. Betz, consulting engineers, Philadelphia.

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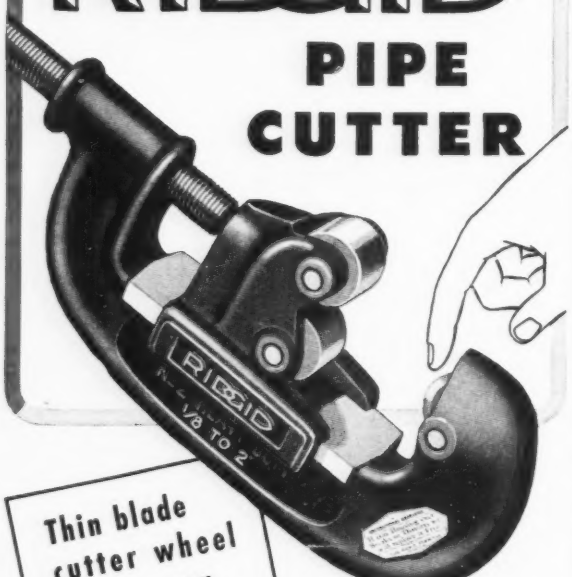

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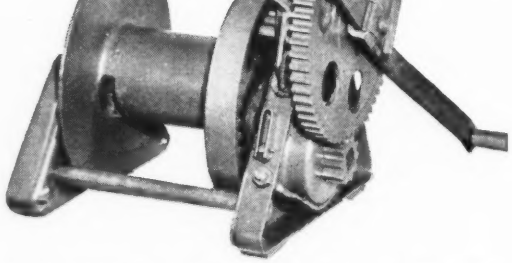

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NATURAL GAS

Michigan Gas Storage Project Authorized

WASHINGTON.—The Federal Power Commission has granted a certificate to Michigan Gas Storage Co., Jackson, Mich., to construct, acquire, and operate facilities for the storage of gas in the Winterfield and Cranberry Lake gas fields in Michigan. Total cost of the project is estimated at approximately $20,107,549.

Michigan Gas Storage proposed to store natural gas received from Panhandle Eastern Pipe Line Co. during the summer season and to withdraw and sell the gas during the winter months, thereby meeting the day-to-day requirements of Consumers Power Co. and possibly other public-utility customers, while purchasing natural gas from Panhandle at a high annual load factor.

The gas which will be purchased from Panhandle at Freedom Junction and Zilwaukee Junction, Mich., will be transmitted northward to the storage fields where in the ultimate program about 15,000,000,000 cu. ft. will be placed into storage each summer for subsequent withdrawal and delivery to Consumers and to other public-utility customers. At the same time, the company would deliver and sell gas through laterals from a new pipe line to be constructed from Freedom Junction to the storage fields.

Chicago Hearing Set on Three Gas Projects

WASHINGTON.—A hearing by the Federal Power Commission on application of three companies—Natural Gas Pipeline Co., Texoma Natural Gas Co., aud Chicago District Pipeline Co.—to construct additional gas-transmission facilities was scheduled to open this week in Chicago.

Added facilities requested by Natural Gas Pipeline and Texoma in their application include construction of 131 miles of pipe line and 60,000-hp. compressor capacity at an estimated cost of $23,238,613. The facilities are designed to increase delivery capacity of the system to 484,000,000 cu. ft. a day and would be completed by January 1, 1950.

Chicago District Pipeline has asked permission to construct a 24-in. pipe line paralleling 11.6 miles of its Crawford line which serves gas to the Chicago metropolitan area. Cost was estimated at $750,000.

The commission granted permission to intervene at the hearing to the National Coal Association, Central Illinois Coal Operators Committee, Illinois Coal Traffic Bureau, Middle States Fuels, Inc., Northern Illinois Coal Trade Association, and Western Railroads.

Gwinville Order Voided; Further Appeal Likely

JACKSON, Miss. — Circuit Judge Hugh B. Gillespie has ruled against an order of the Mississippi Oil and Gas Board setting spacing regulations for gas wells in the Jeff Davis County Gwinville field at one well to each 320 acres.

The ruling, on an appeal carried to the courts by Superior Oil Co., may be appealed by the state Oil and Gas Board to the State Supreme Court as a test case. Superior had sought 640-acre spacing.

The opinion said in part: "The undisputed and uncontradicted evidence before the board and before the court establishes that a gas well in said field will adequately and efficiently drain on an area of at least 640 acres and that 320 acres is not the efficient drainage area of a gas well in said field. . . . Furthermore, said order of the Mississippi Oil and Gas Board complained of wholly and totally fails to include any basis or formula pursuant to which the total field market demand of gas from the Gwinville gas field, a common source of supply, could be allocated as required by the statutes of the state. The board is under mandatory duty to provide a basis of allocation, and the undisputed and uncontradicted evidence in the record before the board and before the court establishes that a fair and equitable distribution and allocation of the market demand would be on the basis of 100 per cent weight given to acreage. . . ."

Royalty Owners Demand FPC Powers Be Checked

CARTHAGE, Tex. — A resolution demanding that the Federal Power Commission be stripped of its power to regulate the production and gathering of natural gas was adopted here last week by the Panola County Royalty Owners Association.

The meeting, held in connection with a celebration commemorating the third anniversary of the opening of the Carthage field, heard Myron Blalock, member of the National Democratic Executive Committee, declare that reluctance of Washington bureaucrats to relinquish wartime power "poses a serious threat" to American freedom.

The resolution charged FPC with disregarding the provision of the Natural Gas Act in dictating the price of gas at the wells. It also challenged authority of FPC to "dictate or prescribe the ultimate use of natural gas."

Gas Company Operating Revenues Show Gain

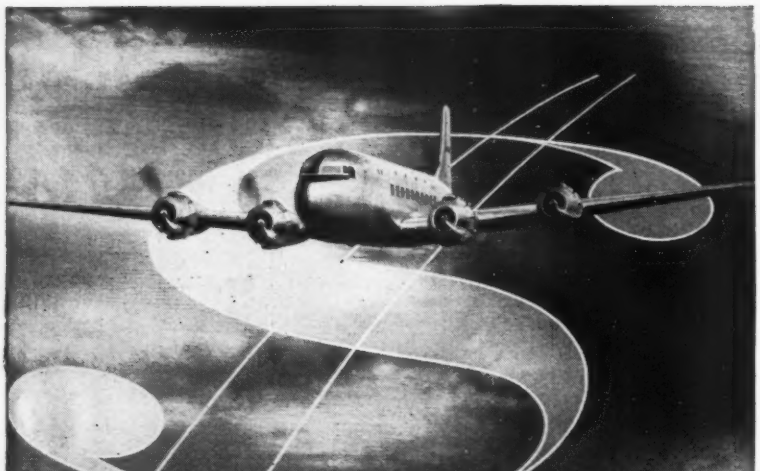
WASHINGTON. — Operating revenues of natural-gas companies reporting to Federal Power Commission amounted to $418,310,526 for the first 9 months of 1946, an increase of 4.1 per cent over $401,801,540 reported for the comparable period in 1945.

Operating-revenue deductions were up 3.1 per cent, decreased accruals for taxes and depreciation having been offset by increasing operating expenses. In the operating expense group the largest percentagewise increase occurred in payments made for salaries and wages which were up 13.5 per cent over last year.

Revenues from industrial service were down 1 per cent from those of last year. Revenues from residential service increased 6.7 per cent, and those from commercial service 6.6 per cent. Corresponding percentage changes in gas sales in the three consumer groups were a 1 per cent decrease in industrial sales and increases of 6.8 per cent and 4.8 per cent, respectively, in residential and commercial sales. Sales of gas to all ultimate consumers for the period were down 3 per cent from last year. Book cost of gas plant of the reporting companies aggregated $1,878,686,997 at September 30 against which there had been accumulated reserves for depreciation in the amount of $689,590,316.

Farthest-North Gas Service Inaugurated

ATHABASKA, Alta. — The most northerly municipal natural-gas service on the continent was inaugurated here recently when Athabaska Utilities, Ltd., headed by C. H. Withers and W. F. Thorn, commenced delivery of natural gas to 250 customers. The company holds a 10-year franchise, utilizing production from a gas well 4 miles from the town.



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1049	1.17	1.98	7.68	12.28	30.70¢
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Silicone News

DC SILICONE

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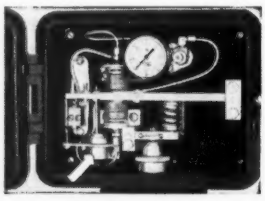

Photo, courtesy The Swartwout Co.

The Thermo Master Control and other control instruments made by the Swartwout Company of Cleveland have been redesigned and made even more sensitive through use of a damping device filled with one of the Dow Corning Silicone fluids (arrow). Previously no damping device was used because conventional organic fluids are subject to such wide changes in viscosity with temperature that they limit rather than increase the sensitivity of these carefully engineered instruments.

With the introduction by Dow Corning of Silicone Fluids unique among liquids for their flat viscosity-temperature slopes, low volatility, and thermal stability, the long standing problem of effective damping over a wide temperature range was solved.

The Thermo Master Control is widely used for regulating temperature in steam desuper-heating involving temperatures ranging from 50° to 950° F. Ambient temperatures may vary from —40° F. to 150° F. Over such a wide temperature span, only silicone fluids remain sufficiently constant in viscosity to damp minor oscillations of the metallic control without lessening the sensitivity of such precision instruments.

More information about DC Silicone Fluids available in several types for a wide variety of applications is contained in catalog No. Y 1-3.

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Adequate Supply of Heating Oils Predicted

Despite the continued phenomenal increase in the use of oil burners, latest forecasts on the supply of domestic heating oils give every assurance that all demands will be met this winter and in the future, according to an article in the current issue of the Lamp, company publication of Standard Oil Co. (N.J.).

The oil industry began last April to lay in stocks of distillate fuel oils and as of November 16 inventories were at a record high for that time of the year, with 67,221,000 bbl. Usually, 60 per cent of distillate fuel-oil stocks find their way into domestic heating oils.

The Fluid catalytic-cracking process is a comparatively new and valuable assurance that future demands for burner oils will be met. The quality of total supplies, too, will meet all requirements, not only of existing types of burners but also of types expected to be sold during the next 10 or 15 years, the article states.

Tracing the increase in the use of oil burners, the article points out that more than half of all American homes having automatic central heating depend on oil. At the end of last year, the total of such homes was 4,768,505. Of these 2,525,655 used oil; 1,160,150, gas; and 1,082,700, coal stokers.

There appears every likelihood that the spread of oil burners will continue. Fuel oil specialists of Jersey Standard indicate that the average of 2,675,000 oil burners estimated to be in use during 1946 will jump to 3,885,000 by 1950 and to 5,925,000 by 1965. At the same time total consumption of domestic heating oils would rise from this year's 143,000,000 bbl. to 186,500,000 in 1950 and 207,500,000 in 1965.

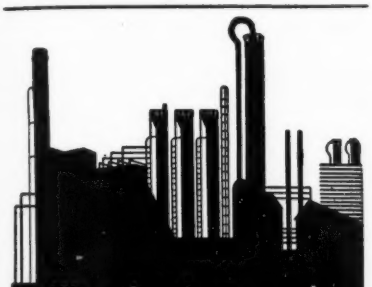
Koppers Co., Inc., Will Build Polystyrene Plant

PITTSBURGH.—A polystyrene plant capable of producing 15,000,000 lb. annually will be built in 1947 by Koppers Co., Inc., at Kobuta, Pa. The company recently bought the styrene plant and acquired control of other facilities of the Government-owned chemical plant at Kobuta and already is producing styrene for use in synthetic rubber and plastics, and polystyrene there.

World Rubber Production Above Needs, Group Says

World production of rubber, both natural and synthetic, will be 100,000 tons greater than demand for the product this year according to a declaration issued from a meeting of the International Rubber Study Group last week in The Hague.

The group estimated 1946 production at more than 1,700,000 tons, in-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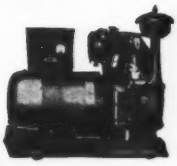
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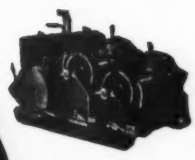
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cluding 940,000 tons of synthetic rubber, and forecast a 1946 consumption of 1,600,000 tons. The declaration expressed concern over the difference between consumption and an increasing production.

Chemical Firm to Build New Plant in Houston

HOUSTON.—A chemical plant to cost more than $3,000,000 will be built on the Houston ship channel by Rohm & Haas Co., Philadelphia. Construction is scheduled to begin on a 570-acre site early in 1947.

One of the country's largest producers of plastics and chemicals, the firm operates plants in Bristol, Pa., and Philadelphia and Knoxville, Tenn.

Foreign Scientists Aid In Synthetics Research

German and Austrian scientists, working in the United States for the Government, are doing extensive research work on synthetic-petroleum production, according to an announcement last week by the War Department.

The studies include hydrogenation of coal to produce synthetic petroleum products, carbonization of coal and oil shale, and synthesis of gas by the German "Fischer Tropsch" process.

Airliners Will Give Way To Jets, Inventor Says

NEW YORK.—Jet-propelled planes with a cruising speed of 600 m.p.h. may be carrying 90 per cent of all commercial air passengers within 5 to 10 years, according to Air Commodore Frank Whittle of the Royal Air Force.

Whittle, who invented the turbo-jet engine, expressed this view last week at a news conference sponsored by the American Society of Mechanical Engineers and the American Rocket Society.

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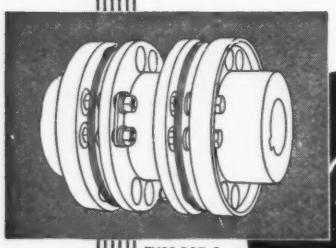

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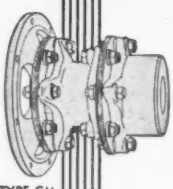

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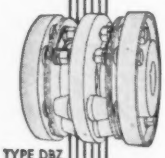

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Shreveport Host to Meeting of Refiners

SHREVEPORT. — A question-and-answer program will be featured at a meeting of the technical group of the Western Petroleum Refiners Association here January 17. The meeting will be held in the Washington-Youree Hotel.

Association officials will mail to members lists of the questions to be discussed in advance of the meeting. A. W. Trusty, chief chemist, Arkansas Fuel Oil Co., will serve as chairman.

Blaze Fails to Affect Production at Refinery

HOUSTON.—The $30,000 fire which seriously injured three persons and burned out nine storage tanks of the Eastern States Petroleum Co. refinery near the Houston ship channel November 30 failed to interrupt production, according to R. B. Kahle, president.

At last reports, definite cause of the blaze still was undetermined. The storage area was situated less than 200 yards from the ship channel.

German Diesel Lab in U. S.

A complete German diesel-engine laboratory has been shipped to the United States and will be set up at a technical school, according to officials of the Office of Technical Services. OTS engineers said they believe American research workers will be able to learn much from German methods and developments.

Rubber Booklet Available

A 50-page booklet, "Five Years of Synthetic Rubber," is now being distributed by United States Rubber Co. The booklet outlines the growth of the synthetic-rubber industry and appraises its present importance in rubber-products manufacture.

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Lane-Wells Drillable Bridging Plugs provide a quick, economical, pressure-tight bridge at any desired depth in casing. Because these Plugs are usually set with conventional Lane-Wells Gun Perforating equipment the well can be plugged and Gun Perforated on the same set-up. This feature makes for fast, economical action in the successive upward testing of multiple horizons and other operations combining plug-back and Gun Perforating.

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The combination of speed and economy effected by the use of Lane-Wells Drillable Bridging Plugs means less down time and lower costs. For complete information about the advantages of Lane-Wells Drillable Bridging Plugs, call your nearest Lane-Wells Branch.

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Not just Contractors but
PIPE LINE SPECIALISTS

PIPE LINES

"Inch" Line Throughput To Be 150,000,000 Cu. Ft.

NATURAL gas throughput of 150,000,000 cu. ft. daily at 200 to 300 psi. will be attained by the end of next week through the combined use of the big-inch and little big-inch lines now operated by Tennessee Gas & Transmission Co. under arrangements which will continue until April 30, 1947, according to J. P. Bristow, vice president of the company.

Early this week T. G. & T. was connecting with Lone Star Gas Co. lines to provide for transmission of 50,000,000 cu. ft. daily via a feeder system (built by War Emergency Pipelines, Inc., in 1942) for transmission through the big-inch (24-in.) line from the Longview, Tex., terminal to Ohio.

Early on December 9 gas being transmitted from the main T. G. & T. system, through a connection with little big-inch (20-in.) at Many, La., had reached French Lick, Ind. Gas sales by the end of this week were estimated to total 100,000,000 cu. ft. with a 50 per cent increase expected by the end of next week. Gas movement started December 4.

Connection between the T. G. & T. and little big-inch at Many, La., was made by means of two 8-in. meter tubes. At Little Rock, Ark., big-inch and little big-inch are tied together by a 12-in. connection. At the three delivery points in Ohio, the two "inch" systems are tied together by connections, mostly of 8-in. diameter. Williams Brothers Corp., custodians of the "inch" lines, is functioning for T. G. & T. in the gas-transmission program.

Gas deliveries according to Federal Power Commission allocations are being made at the following connections: East Ohio Gas Co., at Middletown and Lancaster, Ohio; Ohio Fuel Gas Co., at Hooker, Ohio.

Michigan-Wisconsin Plans For 1,069-Mile Gas Line

Michigan-Wisconsin Pipe Line Co. is preparing for construction of the $52,618,823 project for which the Federal Power Commission recently issued a permit.

The pipe-line facilities authorized include 1,069 miles of 26 and 22-in. main natural-gas-transmission pipe line from Hansford County, Texas, to the Austin storage field near Big Rapids, Mich.; two compressor stations, one in Hansford County and the other near Mount Pleasant, Iowa; a branch transmission pipe line to Wisconsin and lateral lines to the markets to be served. The company was also authorized to operate existing facilities located in the Austin and Reed City storage fields and certain existing transmission lines and metering stations, all in Michigan and now owned by Michigan Consolidated Gas Co.

Engineering for the project is being handled by Ford, Bacon & Davis, which is planning to open an office at Davenport, Iowa, early in 1947.

Great Lakes Co. Tests Northern Extension

Great Lakes Pipe Line Co. has tied in the northern extension under construction in recent months which is

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SOUTH AMERICA
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now in the process of being tested. This consists of 300 miles of 6-in. and 8-in. extending north of Marshall, Minn., which serves Alexandria, Minn.; Fargo, N. D., and Grand Forks, N. D.

Panhandle Eastern To Expand Facilities

Panhandle Eastern Pipe Line Co. will construct additions to its Texas-Michigan natural-gas system. The additions, designated as Group B facilities, are estimated to cost $23,751,550 and to increase the delivery capacity of the system from 393,000,000 cu. ft. daily to 473,000,000 cu. ft. Construction is scheduled to commence in 1947. A permit was recently granted by Federal Power Commission.

The facilities authorized include a field compressor station of 5,000-hp. capacity in Hansford County, Texas, the addition of 9,400-hp. compressor capacity to existing stations, an aggregate of 292 miles of 26-in. third loop line, about 65 miles of 26-in. loop line and about 34 miles of 18-in. loop line paralleling existing lines, 5 lateral lines to Michigan communities, river crossings, valve and pipe changes at compressor stations on the main lines and appurtenant equipment.

Within 15 days, the commission said last week, it will issue a supplemental order fixing "the rights and duties" of Panhandle in its established service in the Detroit market.

This order, the commission said, will take into account Panhandle's rights and obligations under its "grandfather certificate," and upon the expiration of its contract with Michigan Consolidated on December 31, 1951, and its gas deliveries in the last 5 years. (A grandfather certificate is one held since 1942.)

Mid-Continent Gas Plans Hugoton-St. Paul Project

Mid-Continent Gas Transmission Co. is making plans on the basis of a prospective possibility that Federal Power Commission authorization and pipe deliveries will enable work to start late in the fall of 1947 and to be finished in 1948, for a project to be built of 22-in. and 26-in. pipe with a total mileage of 838 miles.

The line is to extend 400 miles from the Oklahoma Panhandle section of the Hugoton field to Kansas City and 438 miles from there to St. Paul, Minn. Gas deliveries contemplated are: 345,000,000 cu. ft. daily during the first year; 497,000,000 cu. ft. daily 5 years later.

Headquarters of the company are located at 1220 Minnesota Building, St. Paul, Minn. Officers of the company are: W. D. Weidlein, president and treasurer; Jerome Hoffman, vice president and general counsel; and Irwin Smatteringer, director. Engineering work is being done by J. F. Pritchard Co., Kansas City, Mo.

U. S. Handbook Describes Rust-Resistant Coatings

WASHINGTON. — The application of rust-resistant coatings to iron and steel by immersion in an acid-phosphate bath is described in a 113-page handbook now on sale by the Office

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With
Maximum SPEED
Minimum COST

The H & M PIPE CUTTING and BEVELING MACHINE

SPEED: Complete cut and bevel can be made on 12 inch pipe in about 2 minutes.

ECONOMY: Save approximately one-half labor and gas costs.

PORTABILITY: Can easily be carried from one pipe section to another.

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Winter Time
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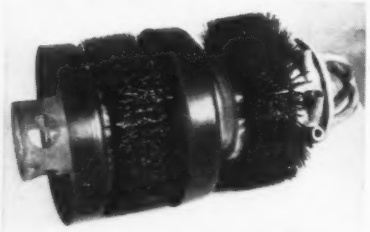

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For crude, products, natural gas and water lines. Sizes 6-inch to 20-inch. Other types in sizes 2-inch to 26-inch.

*Patent pending.

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of Technical Services, Department of Commerce.

The handbook was written by Lloyd O. Gilbert, Rock Island Arsenal laboratory, U. S. Army Ordnance Department. Originally prepared for use in rust-proofing Army ordnance equipment, the handbook may prove helpful to metal working technicians in setting up and operating phosphating equipment, according to a department announcement.

The rust-proofing processes described use standard commercial phosphating solutions.

Views Differ on Use of Big-Inch for Gas

REACTION of state officials last week to the announcement that the big-inch pipe lines will be used for emergency transmission of natural gas varied generally in accord with their already-known positions on expansion of the natural-gas industry.

Some of the statements reiterated views expressed in hearings conducted by the Federal Power Commission in its investigation of the natural-gas industry.

Gov. Edward Martin of Pennsylvania said "there must be compelling reasons" for Pennsylvania to favor use of the big-inch lines for the transportation of natural gas into the Keystone State.

Pennsylvania must agree to permit use of the lines for gas, instead of petroleum or petroleum products if the lines are to be used. Easements given by the commonwealth at the time the lines were built stipulated they could be used only to transport petroleum.

Allen J. Johnson, Landsdown, Pa., representing the Anthracite Institute, told the House surplus-property investigating committee that permanent gas transmission would slash $95,000,000 from the annual business of the anthracite fields, eliminate 11,724 of the anthracite miners and "jeopardize a billion-dollar investment."

James M. Souby, representing the Association of American Railroads, testified it would displace 6,000,000 to 7,000,000 tons of coal annually and "have a substantial adverse effect on railroad employment."

In a resolution adopted by both houses of the last legislative session in Arkansas and subsequently signed by Gov. Ben Laney, it was stated that Arkansas would join in any move by other states to help prevent these lines being used to transport "our cheap fuel away from places that should be using it to bring industry to the Southwest."

Conversion of these lines to gas, P. A. Frye, director of natural-gas conservation for Louisiana, said, would mean a substantial additional drain on the limited reserves of this area and would accomplish practically nothing toward supplying the fuel needs.

"If they really want to do something to relieve the fuel needs in that territory," he asserted, "the lines should continue to handle fuel oil, not natural gas."

Railroad Commissioner E. O. Thompson hailed the use of the lines for the transportation of gas to the East as the "dawn of a new day for this section." But Commission Chairman Olin Culberson held the belief that piping gas to the East would deplete Texas resources; that he did not deem the plan practical, but would not oppose it.

H. J. Porter, president, Texas Independent Producers and Royalty Owners Association, in testifying before the committee said: "Regardless of to whom big-inch lines are sold, if they remain in place they will be used as gas lines. We do not believe that any bidder for the lines has any intention of using the lines for anything except the transportation of gas. Except in times of emergency when tanker transportation might be interrupted by enemy action, there are no economic or practical reasons for the operation of these lines as crude-oil or products lines from Texas to the East Coast. . . ."

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Thread pipe with almost automatic speed and ease...

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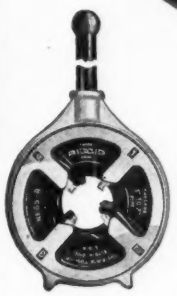

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STATISTICS and T

WEEKLY WELL COMPLETIONS . . . WEEK ENDED DECEMBER 7, 1946

	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1946				
	Comp.	Oil	Gas	Dry	Footage	1946	1945	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	29	15	0	*14	40,937	1,479	1,388	0	0	0	0	0	0	0	0	0	0
Pennsylvania	68	39	1	†28	104,826	3,715	3,794	0	0	0	0	0	0	0	0	0	0
West Virginia	9	3	4	2	26,614	704	766	0	0	0	0	0	0	0	0	0	0
Ohio	24	3	16	5	67,962	1,193	943	0	0	1	1	2	3	0	14	40	57
Indiana	9	5	0	4	18,707	352	184	1	0	0	2	3	5	0	0	20	25
Kentucky	14	1	9	4	32,430	447	539	0	0	0	0	0	7	0	0	37	44
Illinois	37	16	1	20	95,516	2,153	1,705	0	0	1	6	7	52	0	2	428	482
Michigan	7	2	2	3	13,250	756	717	0	0	0	2	2	21	0	10	240	271
Kansas	57	27	17	13	175,381	1,888	1,663	2	0	0	3	5	29	0	2	256	287
Neb., Mo., Iowa	0	0	0	0	0	19	29	0	0	0	0	0	0	0	0	14	14
Oklahoma	70	40	4	‡26	207,241	2,821	2,269	3	0	1	18	22	91	0	38	380	509
Texas	141	92	3	46	609,130	7,337	6,747	2	1	0	21	24	201	28	32	1,208	1,469
North Central	47	26	0	‡21	114,213	2,560	2,074	0	0	0	10	10	71	0	4	494	569
West	41	37	1	3	205,637	1,661	1,636	0	0	0	0	0	47	0	1	162	210
Panhandle	0	0	0	0	0	288	511	0	0	0	0	0	0	0	0	5	5
Eastern	12	4	1	7	58,850	654	363	1	0	0	4	5	45	22	13	235	315
Gulf Coast	29	17	1	11	192,876	1,620	1,580	1	1	0	5	7	19	4	5	105	133
Southwest	12	8	0	4	37,554	554	483	0	0	0	2	2	19	2	9	207	237
Louisiana	18	11	2	5	84,971	1,314	1,032	0	0	1	1	2	45	13	8	174	240
Northern	13	7	2	4	33,372	749	446	0	0	1	0	1	9	0	3	95	107
Southern	5	4	0	1	51,599	565	586	0	0	0	1	1	36	13	5	79	133
Arkansas	3	2	0	1	9,405	169	167	0	0	0	1	1	8	0	0	37	45
Mississippi	6	2	0	4	48,003	238	345	0	0	0	3	3	1	0	1	66	68
Southeastern States	1	1	0	0	3,300	42	57	0	0	0	0	0	1	0	0	34	35
Montana	0	0	0	0	0	298	299	0	0	0	0	0	10	0	4	31	45
Wyoming	1	0	0	1	3,527	158	214	0	0	0	0	0	12	0	3	34	49
Colorado-Utah	8	8	0	0	52,231	160	53	1	0	0	0	1	5	0	0	16	21
New Mexico	5	4	1	0	25,386	375	390	0	0	0	0	0	4	0	0	36	40
California	18	7	3	8	85,196	1,390	2,089	0	0	1	11	12	27	0	6	218	251
Total United States	525	278	63	184	1,704,013	27,008	25,390	9	1	5	69	84	522	41	120	3,269	3,952
Total previous week	558	292	78	188	2,010,798	26,483	24,742	7	1	3	74	85	513	40	115	3,200	3,868
Total Dec. 8, 1945	548	292	68	188	1,902,168			7	1	4	60	72	487	23	130	3,247	3,887

Service wells included: *14, †28, ‡1.

MARKET QUOTATIONS

GRAVITY SCHEDULES

Top prices include all gravities above grades designated, and low prices include all gravities below grades designated:

Gravity—	Signal Hill, Calif.	Oklahoma, Kansas	Gulf Coast Tex.*	West Tex.†
18-18.9	$1.17			
19-19.9	1.21			
20-20.9	1.24	$1.30		$1.17
21-21.9	1.28	1.32		1.19
22-22.9	1.32	1.34		1.21
23-23.9	1.35	1.36		1.23
24-24.9	1.39	1.38	$1.61	1.25
25-25.9	1.43	1.40	1.63	1.27
26-26.9	1.46	1.42	1.65	1.29
27-27.9	1.50	1.44	1.67	1.31
28-28.9	1.54	1.46	1.69	1.33
29-29.9	1.57	1.48	1.71	1.35
30-30.9	1.61	1.50	1.73	1.37
31-31.9		1.52	1.75	1.39
32-32.9		1.54	1.77	1.41
33-33.9		1.56	1.79	1.43
34-34.9		1.58	1.81	1.45
35-35.9		1.60	1.83	1.47
36-36.9		1.62	1.85	1.49
37-37.9		1.64	1.87	1.51
38-38.9		1.66	1.89	1.53
39-39.9		1.68	1.91	1.55
40 and above		1.70	1.93	1.57

*For crude from Daboval, El Campo, and Sandy Point. †Includes Lea County, New Mexico.

(Quotations shown here are f.o.b plant in tank cars and in cents per gal. as of last Monday.

REFINERY GASOLINE

Octane (A.S.T.M.)	78-78½†	73-75
Mid-Continent*	7.375-7.625	6.625-7.000
Tex. Gulf Coast	7.250	6.500-6.750
New York Harbor	9-10.75	8-9.25
California		6.250-6.750

*Basic Oklahoma Group 3. †1939 C.F.R. (research method).

NATURAL GASOLINE

Grades—	26-70	18-55
Oklahoma (Group 3)	5-5.125	6-6.15
N. Texas (f.o.b. plant)	4.250	5.100
N. Louisiana (f.o.b. plant)	4.500	5.400
California (averages)	5.500	6.250

CRUDE-OIL PRICES

Representative posted schedules per bbl

East Texas	$1.70
Kettleman Hills, California*	1.69
Beauregard Parish	1.65
Illinois Basin	1.82
Pecos County, Texas (Yates)	1.40
Bradford, Pennsylvania	3.41
Eastern Ill., and Western Ind.	1.67

Note: Crude prices exclusive of subsidy.

A.P.I. REFINERY REPORT

Week ended November 30, 1946
(Figures in thousands of barrels)

	Daily crude runs to stills	Stocks—Gasoline	Stocks—Distillate	Stocks—Residual
East Coast	739	19,300	24,180	11,029
Appalachian	165	3,316	702	638
Ill., Ind., Ky.	772	15,104	8,229	5,156
Okla., Kan., Mo.	375	8,739	3,483	1,354
Inland Texas	217	3,416	581	885
Tex. Gulf Cst.	1,123	13,945	11,381	7,588
La. Gulf Cst.	330	4,566	4,185	2,379
N. La., Ark.	50	1,778	508	161
Rocky Mtn.	133	1,758	532	658
California	803	16,449	12,281	28,799
Total 11-30-46	4,707	88,371	66,062	58,647
Total 11-23-46	4,621	87,446	66,543	60,065
Total 12- 1-45	4,609	86,540	44,562	45,932

CRUDE-OIL STOCKS

(Bureau of Mines Estimate)

Week ended—	Bbl. of crude*
November 23, 1946	225,119,000
November 16, 1946	221,670,000
November 24, 1945	219,363,000

*Excludes unrefinable Calif. stocks.

TRENDS

DAILY AVERAGE PRODUCTION FOR WEEK

	Dec. 7 crude oil	B. of M. Nov. demand	Nov. 30 crude oil
Alabama	1,000	1,200	1,000
Arkansas	79,100	77,000	79,100
California	873,500	850,000	870,000
Colorado	38,520	32,000	38,810
Eastern	64,500	64,200	65,000
Florida	215	200	.....
Illinois	201,300	212,000	205,150
Indiana	20,650	19,000	19,600
Kansas	249,550	263,000	275,500
Kentucky	30,300	29,000	30,000
Louisiana	409,085	382,000	407,950
North Louisiana	98,900	.....	98,600
South Louisiana	310,185	.....	309,350
Michigan	44,530	46,000	43,265
Mississippi	80,800	60,000	80,550
Montana	23,480	24,000	24,730
Nebraska	750	800	750
New Mexico	102,215	99,000	100,500
Oklahoma	371,050	383,000	367,500
Texas	2,010,450	2,090,000	2,096,750
District 1 (Southwest)	18,870	.....	19,000
District 2 (Southwest)	136,550	.....	147,200
District 4 (Southwest)	211,304	.....	226,300
District 3 (Gulf Coast)	428,582	.....	464,300
District 5 (Eastern)	34,932	.....	36,850
District 6 (Eastern)	100,190	.....	105,100
East Texas field	317,143	.....	324,000
District 7C (West)	27,958	.....	29,500
District 8 (West)	500,800	.....	507,250
District 7B (W. Central)	34,614	.....	35,300
District 9 (N. Central)	118,486	.....	121,400
District 10 (Panhandle)	81,021	.....	80,550
Wyoming	102,480	97,000	103,190
Miscellaneous	.....	600	.....
Total United States	*4,703,475	4,730,000	4,809,345

Change from prev. wk., down 105,870

Total production January 1-December 7 ..... †1,621,028,224 bbl.
Same period last year (crude, plus condensate) 1,596,584,225 bbl.
*Not incl. 23,965 bbl. condensate. †Incl. 8,189,005 bbl. condensate.

CRUDE-OIL STOCKS 225,119,000 bbl. as of November 23—up 3,449,000 bbl. One year ago 219,363,000 bbl.

GASOLINE STOCKS 88,371,000 bbl. as of November 30—up 925,000 bbl. One year ago 86,540,000 bbl.

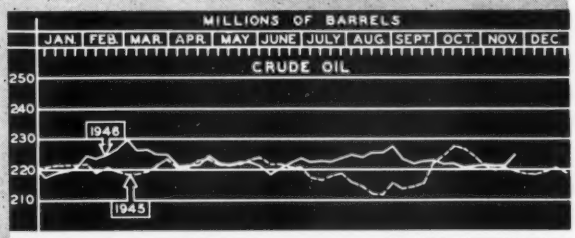
RESIDUAL FUEL-OIL STOCKS 58,647,000 bbl. as of November 30—down 1,418,000 bbl. One year ago 45,932,000 bbl.

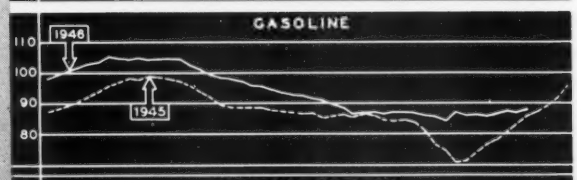
GAS OIL AND DISTILLATE STOCKS 66,062,000 bbl. as of November 30—down 481,000 bbl. One year ago 44,562,000 bbl.

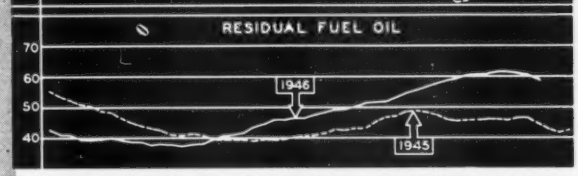
CRUDE-OIL PRODUCTION 4,703,475 bbl. as of December 7—down 105,870 bbl. One year ago 4,493,100 bbl.

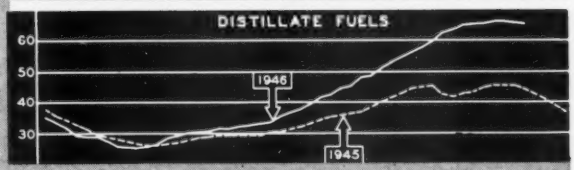
REFINERY RUNS 4,707,000 bbl. daily week ended November 30—up 86,000 bbl. One year ago 4,609,000 bbl.

OIL STOCKS IN THE UNITED STATES

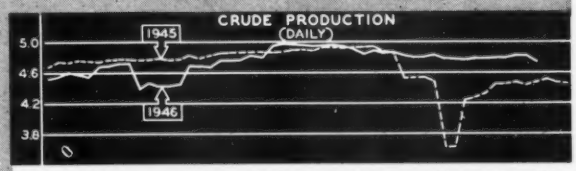


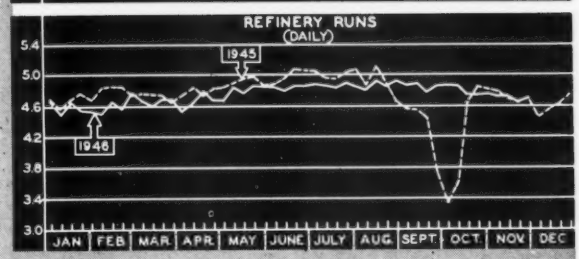




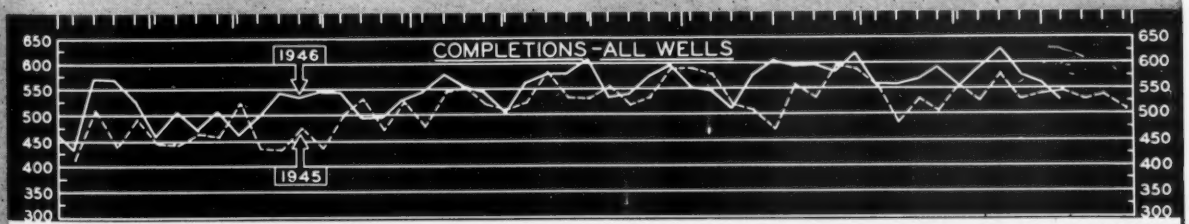


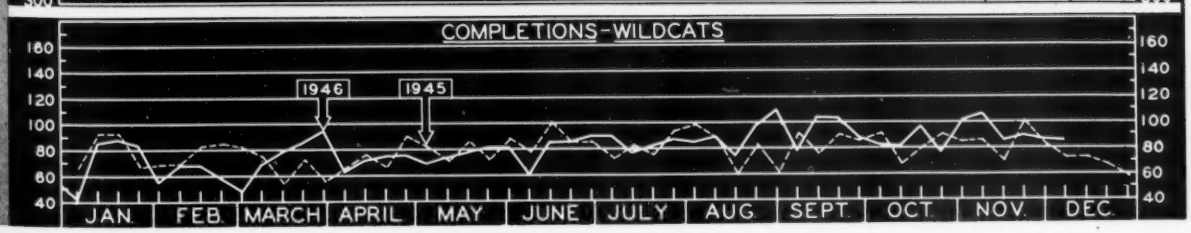
DAILY OPERATIONS





Solid line charts weekly completions, service wells in Eastern area included.





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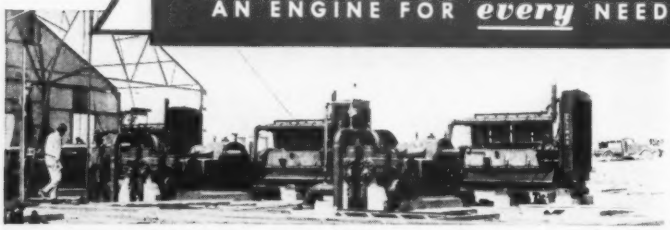

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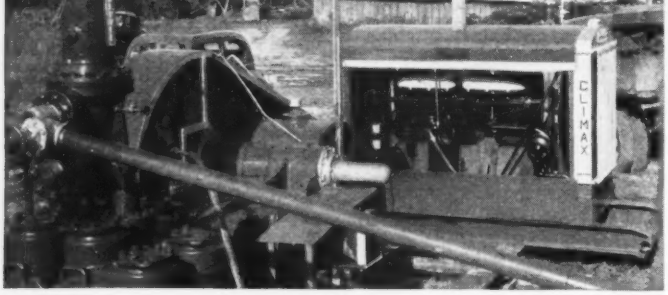
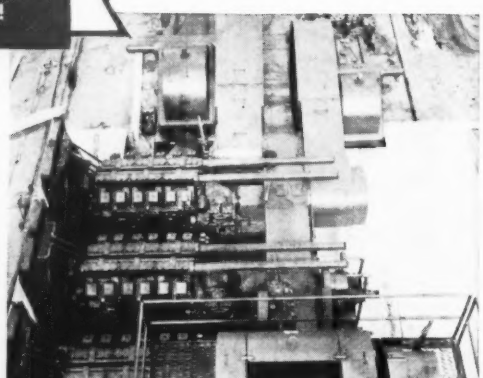


Slush Pump. R6I engine driving separate mud pump on drilling rig. A sturdy dependable engine for pumps, small rigs, etc. Rated 150 h.p. at 1050 r.p.m. as completely equipped power unit.



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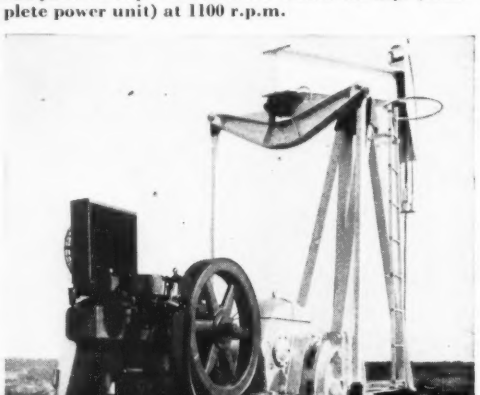
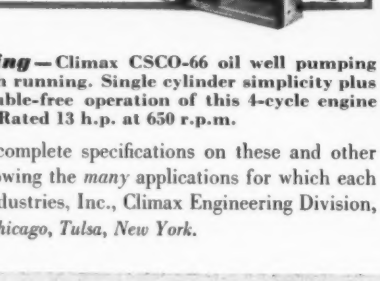


VU 280. 8 cylinders, 60° V-type. A rugged engine for hard, deep drilling and other heavy duty service. Rated 280 h.p. at 1100 r.p.m. with radiator, fan and other accessory equipment.



AT RIGHT: ***Oil Well Pumping***—Climax CSCO-66 oil well pumping engine. Quick starting—smooth running. Single cylinder simplicity plus modern refinements mean trouble-free operation of this 4-cycle engine with a minimum of attention. Rated 13 h.p. at 650 r.p.m.

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Exploration and Drilling

Significance of Drilling Records

THE drilling branch of the industry has completed its postwar reconversion period and is back to normalcy. Of course this branch defines normalcy as making the "impossible" of a few years ago, the "normal" of today. The signs of the return to normalcy are quite apparent.

Right now there are at least four wells drilling that are establishing new records of one kind or another. In California, a new world total-depth record has already been established. Pacific Western Oil Corp. 1 National Royalties, in 5-6s-22e, Kern County, 7 miles east of Lost Hills, is drilling below 16,658 ft., having already broken the old record of 16,655 ft. The old record was set by Phillips Petroleum Co. 3 Schoepps, in Brazos County, Texas, in 1945.

In Oklahoma a new depth record for the state has already been set and the present world's record is a target that may be within reach. Superior Oil Co. 51-11 Weller, in 11-8n-12w, Caddo County, is drilling below 15,987 ft., with equipment believed capable of reaching 17,000 ft. or a little better. Old record of 14,582 ft. was set by Continental Oil Co. 1 Proctor, in Washita County, in 1938.

In Mississippi, Superior Oil Co. 1 Cassie Bradford, 3 miles southeast of the city limits of Hattiesburg, is reported to be about 15,730 ft., a new depth record for that state. The old record of 12,843 ft. was set in 1943 by the California Co. 1 Smith et al, in the Brookhaven area of Lincoln County.

Within the boundaries claimed by the state of Louisiana, but 5 miles out in the Gulf of Mexico from the nearest dry land, Magnolia Petroleum Corp. 58 Louisiana Gulf Block continues to make history daily. It is now drilling below 9,000 ft. This well is by far the farthest from land, in open water, of any well ever drilled. It is 5 miles out from Point Au Fer, in Terrebonne Parish, and outside of Atchafalaya Bay.

There are two ways of looking at the significance of these wells. One, quite obvious, is to assume that this is part of the great American characteristic of always wanting to achieve something bigger, better, higher, or deeper, than anyone else in the world. There is a certain amount of truth in this. Patently, even if no oil is found, much will be learned about how to make all drilling equipment better and cheaper, by straining the best available to see what its limits are. Almost invariably something is learned about equipment on the deepest wells that results in improvements on all rigs later, even on rigs intended only for shallow drilling.

But the real significance is that development of economical and practical deeper-drilling equipment is a must if the future exploration plans of the industry are to be realized. Furthermore, drilling in open water is a definite necessity in exploration programs now under way. To reach the goals set, there must be a balance between the industry's pre-drilling exploration techniques and the drilling equipment for the wildcat tests.

The geologists and geophysicists have just about mastered most of the techniques necessary to hunt for deeply buried structures in the interior of the great sedimentary basins. Hitherto most of our fields have been on the outer rims of these basins at comparatively shallow depths. Now the trend is definitely toward moving out into the interior of these basins for deep oil fields. (See The Oil and Gas Journal, July 22, 1944, page 93).

Moreover, the continental shelf area, offshore, is beginning to loom as a more attractive exploration prospect every day. According to Wallace Pratt (See The Oil and Gas Journal, December 6, 1946, page 62), the offshore prospects are two and one-half times as great as the dry-land prospects. Hence the necessity of developing exploration and drilling techniques for the water-covered areas. With the aid of radar as a surveying instrument, geologists and geophysicists are mastering their part of the problem. The drillers must keep pace.

Magnolia's 5-mile-out well is a record breaker today. But already the governments of Venezuela and of the Island of Trinidad are giving serious consideration to the problems that will be involved, if, as, and when, oil fields are found in the shallow waters of the Gulf of Paria, between the present fields of Trinidad and eastern Venezuela.

The ideas and concepts of the geologists and geophysicists about where and in what quantities oil will be found in the future are on a grand scale. That these are not dreams is evidenced by the fact that the managements of several sizable companies are thoroughly sold on the soundness of these concepts and are backing their judgment with large appropriations for the acquisition of concessions and for scientific exploration work.

When the time comes to drill the wildcat development wells on these prospects, drilling equipment and techniques must be ready. The real significance of finding four record-breaking wells drilling at one time is that the drilling branch of the industry is preparing now for the everyday needs of the next decade.

N. CENTRAL TEXAS

Montague County Wildcat Flows 30 Bbl. Oil Hourly

WICHITA FALLS.—Eason Oil Co.'s Montague sand discovery, the 1 Temple Yarbrough, 4 miles north of St. Jo, will be completed for a potential of 30 bbl. of oil an hour. The well was swabbed in and allowed to flow about 4 hours, with no estimate of the flow, then gaged for 20 minutes. Pay zone is an unidentified sand at 4,045-4,122 ft., total depth.

Eight miles north of Bellevue, in Clay County, R. C. Lipscomb 1-A Hapgood opened a new Strawn sand area. Drill-stem tested for 14 minutes at 4,975-5,000 ft., gas showed at the surface in 9 minutes and the net recovery was 900 ft. of oil. Operators will set casing before further testing.

Shackelford County's deep test, the 1 G. R. Davis, drilled by Stanolind Oil & Gas Co. 16 miles northeast of Abilene, was preparing to take another drill-stem test in the Ellenburger which was topped at 4,845 ft. First tests, taken in the top of the formation, showed no oil, water or gas, and operators drilled ahead.

In Grayson County, 6 miles southeast of Collinsville, Seitz-Comegys-Seitz et al 1 Fielder, in the J. D. Nelson Survey, was drilling ahead below 3,812 ft. in shale after recovering 75 ft. of salty mud on drill-stem test at 3,638-49 ft.

NORTH CENTRAL TEXAS WILDCAT FAILURES

Archer County: John L. Crawford 1 Jones, Jefferson County School Land Sur., 3½ mi. S of Archer City, elev. 1,053 ft., dry, TD 1,202 ft. in shale.

Harvey Drilling Co. et al 1 C. L. Abercrombie "O," M. Hutchinson Sur., 2½ mi. W of Archer City, elev. 1,038 ft.,

dry, TD 1,469 ft. in shale, Gunsight lime 1,334 ft.

Harvey Drilling Co. et al 1 C. L. Abercrombie "P," Wm. Cound Sur., 2½ mi. W of Archer City, elev. 1,112 ft., dry, TD 1,467 ft. in shale and sand, Gunsight lime 1,400 ft.

Wichita County: Frank Wood 1 M. Vanloh, T. E. Williams Sur., 3 mi. SW of Clara, dry, TD 2,094 ft., broken sand with light oil show 1,875 ft.

Young County: A. R. Dillard 1 S. R. Jeffery, P. Vivian Sur., 5 mi. N of Graham, elev. 1,128 ft., dry, TD 5,004 ft., top limestone 3,934 ft., slight show of oil 4,136-50 ft., Mississippi lime 4,764 ft.

WEST CENTRAL TEXAS WILDCAT COMPLETIONS

Calahan County: Martin Properties 1 W. N. Foster, Subd. 7, Victory CSL 337, 10 mi. SE of Baird, elev. 1,835 ft., dry, TD 2,504 ft. in shale, sand with show of oil 1,055 ft., lime with show of oil 2,326 ft.

Anzac Oil Corp. 2 W. P. Brightwell, Victoria CSL 202, 10 mi. W of Cross Plains, elev. 1,705 ft., dry, TD 798 ft., sand with slight show of oil 790-92 ft.

Jones County: W. H. Rogers, Jr. 1 J. L. Herndon estate, Sec. 16, Blk. 2, SPRR Sur., 4 mi. SW of Anson, elev. 1,814 ft., dry, TD 2,953 ft., Dotham limestone 2,055 ft., Saddle Creek 2,898 ft.

Shackelford County: Harry Hines et al 1 Alice Walker, Sec. 59, Blk. 13, T&P Sur., 15 mi. SW of Albany, elev. 1,924 ft., dry, TD 1,865 ft., sand with slight show of gas 1,719-23 ft.

Taylor County: Ungren & Frazier 1 B. D. Loving, Sec. 15, Blk. 16, T&P Sur., 6 mi. NW of Abilene, elev. 1,706 ft., dry, 2,530 ft., Dotham 1,715 ft., Noodle Creek 1,828 ft., Coal 2,115-18 ft., Flippen 2,128 ft., Gunsight 2,410 ft.

Fig. D322

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SOUTHWEST TEXAS

New Oil Field Found In Live Oak County

CORPUS CHRISTI.—A new oil pool has been opened in southeastern Live Oak County, approximately ½ mile northwest of Lagarto, by Roxie Wright et al 1 S. F. Beall Estate. On potential gage this test flowed 49 bbl. of 43°-gravity oil per day through 3/32-in. choke, with 600 lb. tubing and 1,165 lb. casing pressure. Gas-oil ratio 1,790 to 1. Production is through perforations at 5,582-85 ft. Operators are drilling a new test 3,100 ft. southwest of the 1 Beall, and ½ mile west of Lagarto.

Daubert & Achning 1 M. Villareal, new discovery well in northeastern Starr County, approximately 1¼ miles southeast of the Kelsey field, in the Santa Cruz grant, flowed 139 bbl. of oil in the first 10 hours of initial gage through a 5/32-in. choke, or an average of 333.6 bbl. per day. Working pressure is 800 lb. Total depth is 5,956 ft., and oil sand was logged from 5,926-46 ft.

A new discovery 1 mile west of the Seven Sisters field in Duval County, J. C. Palmer 1 Welder Heirs, is preparing to install pumping equipment for completion. Drilled to a total depth of 2,600 ft., the well swabbed pipeline oil through perforations at 2,589-2,600 ft. in the Mirando sand. This well is located in Samuel Alexander Survey 102.

A possible new pay zone for the South Kelsey area in Starr County has been indicated at J. O. Clark, Jr. 1 M. G. de Juarez. On a drill-stem test at 5,365-70 ft., using $\frac{3}{4}$-in. and 1-in. chokes, recovered 350 ft. of 46°-gravity oil in 20 minutes. The 5,500-ft. sand yielded a light recovery of oil with gas blow at 5,33-41 ft. with 35 lb. working pressure. This test is located in the Santa Teresa grant.

The first commercial Pettus sand producer in the Cabeza Creek (Wilcox) field in Goliad County, has been completed at Continental Oil Co. 11 J. E. Pettus et al, east extension well. It flowed a potential gage of 191 bbl. of 46°-gravity oil per day through an 11/64-in. choke, with gas-oil ratio 787 to 1. Production is through perforations at 4,528-33 ft. Operators drilled this well to the regular Wilcox pay zone for this field before coming back up the hole to perforate the Pettus for completion. Wilcox sand was topped at 7,602 ft. Total depth is 7,845 ft., and the 6-in. casing is set on bottom. This well is located in the Sebastiano Vela Survey.

There were 33 new locations reported this week, 9 being wildcats, 1 each in Bee, Duval, Gonzales, Jim Wells, Karnes, Live Oak, San Patricio, Webb and Zapata counties. One new pool in Refugio County, and new pay in Goliad County, Cabeza Creek field, were reported, while four wildcats were dry, one each in Bee, Live Oak, McMullen and Uvalde counties.

SOUTHWEST TEXAS SUCCESSFUL WILDCATS

Goliad County: New oil sand in Cabeza Creek field—Continental Oil Co. 11 J. E. Pettus et al, Sebastiano Vela Sur., top Pettus sand 4,528 ft., TD 7,845 ft., perf. 4,528-33 ft., PT 191 bbl. oil through 11/64-in. choke, gas-oil ratio 787 to 1, TP 700 lb., CP 1,400 lb., gravity 46°, 0.1 per cent water.

Refugio County: New gas-condensate pool —Wil-Tex Oil Corp. and Herman E. Brown 1 Jamie Hunes, M. Arocha Sur., 3 mi. NW of Refugio and 1 mi. NW of old Refugio field, top pay 6,480 ft., TD 7,453 ft., perf. 6,480-82 ft., PT 18,000,000 cu. ft. gas per day on open flow and

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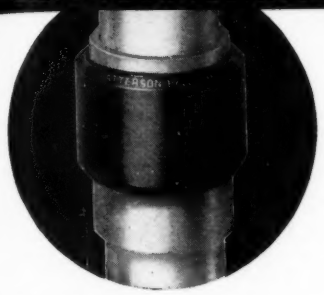

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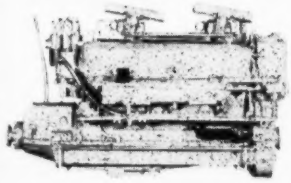

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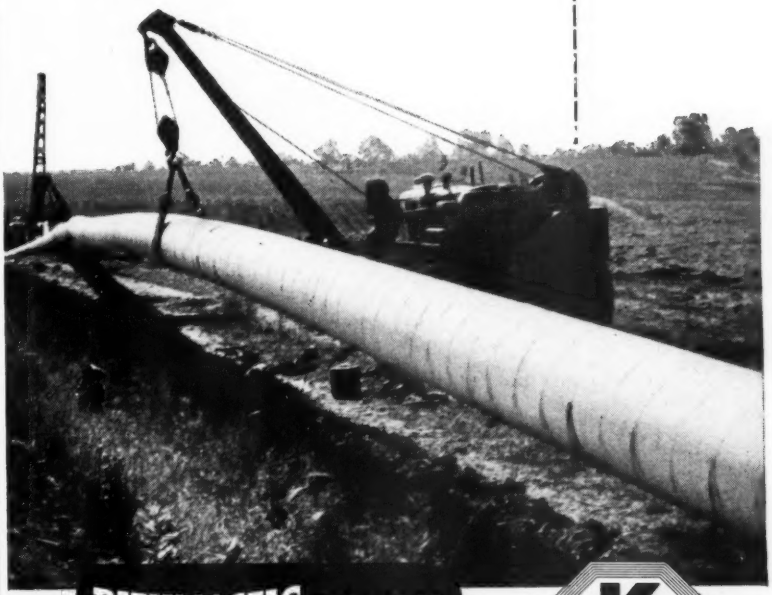

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SOUTHWEST TEXAS WILDCAT FAILURES

Bee County: Stanolind Oil & Gas Co. 1 Nelson Lytle, Jr., in Maley, New & Cryer Surs., 3½ mi. SW of Mineral, dry, TD 9,018 ft.

Live Oak County: Rowan & Hope 1 J. F. Goodwin Est., John Ely Sur., approximately 8 mi. E of George West, dry, TD 4,502 ft.

McMullen County: Harry Ezzell 2-A Harry Ezzell, Sec. 39, Ezzell Ranch subdn. of S. B. Turner Sur., dry, TD 2,045 ft.

Uvalde County: J. A. Green 1 Kennedy-Nunley, in Jesus Flores Sur., 7 mi. S of Sabinal, dry, TD 3,512 ft.

MICHIGAN

Oceana County Has Prospects of Major Oil Discovery

SAGINAW.—Completions dropped to 7, and new locations totaled 16 in Michigan oil and gas fields in the past week as attention of oil men turned to a Carter Oil Co. wildcat in Oceana County.

The Carter 1 Miller, in Section 11 of Claybanks Township, was reported to have flowed 10 bbl. an hour, pinched, on an 8-hour test. Production is from the Traverse formation at 1,629 ft. In two subsequent tests the well flowed for about a half hour before subsiding. Carter Oil has several thousands of acres under lease in the area. The location is 5 miles south and 4 west of Shelby.

While veteran Michigan oil men were cautious in discussing its prospects, they were hopeful, recalling that it has been 2 years since Michigan has had a major discovery.

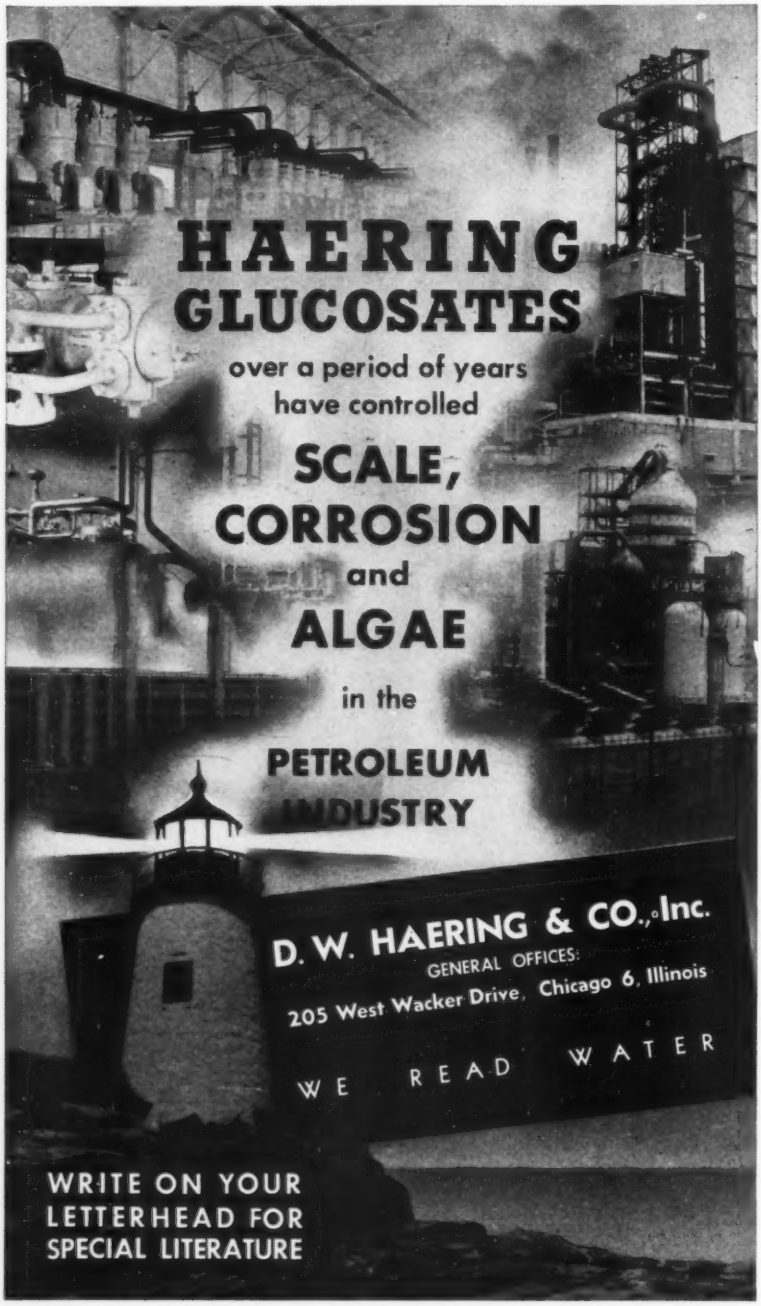
Of the week's completions, two were oil producers and two were gas wells. Two of the three dry holes were wildcat ventures.

Seven of the new locations are in Clare County, three in Isabella, two in Ottawa, one each in Newaygo, Allegan, Missaukee and Van Buren.

MICHIGAN WILDCAT FAILURES

Bay County, Garfield Township: H. E. Bell 1 Harold Kehr, NW NE SE 31-16n-3e, dry in Dundee, TD 3,441 ft.

Mecosta County, Morton Township: Michigan Consolidated Gas Co. 1 Patrick-Lake, C SE 16-14n-8w, dry, TD 1,298 ft.



TEXAS GULF COAST

Gas Field Found Northwest Of South El Campo Pool

HOUSTON.—A new gas pool for Wharton County, 1 mile northwest of production in the South El Campo pool and ¾ mile northwest of production in the Daboval pool, has been opened by Floyd Karsten 1 J. L. Reitz, in E. T. Railroad Survey, Section 50, Abstract 513. Drilled to a total depth of 7,200 ft., this new pool opener flowed at the rate of 3,250,000 cu. ft. of gas daily, through two ¼-in. chokes, with 2,200 lb. flowing pressure and shut-in pressure of 2,600 lb. Some condensate was along with the gas but no gage was made on the condensate flow. The 5½-in. casing was cemented at 6,903 ft., and production is through perforations at 6,838-42 ft.

Sun Oil Co. and Cities Service Oil Co. 1 Martin-Davis, extension wildcat test in the North Delhi area of Harris County, is flowing dry gas through a ⅛-in. choke with 2,525 lb. pressure. Production is through perforations at 7,047-56 ft. Well is still cleaning and no gage has been made.

The Katy pool of Harris County has been extended to the east by the completion of Houston Oil Co. of Texas 1 Emma Waterwall, in H&TC Survey. The well flowed a potential of 110 bbl. of 40°-gravity oil in 24 hours through a 6/64-in. choke. Tubing pressure was 1,200 lb. with gas-oil ratio of 830 to 1. Production was through perforations at 6,839-41 ft. Total depth is 6,909 ft., with sand topped at 6,812 ft.

Eli Marks 1 A. B. Cohn Estate, wildcat test in the Meredith Duncan Survey, in Harris County, cored saturated sands between 8,670 and 8,700 ft. Operators are preparing to set 5½-in. pipe for a production test. Total depth is 9,087 ft.

Pan American Production Co. 1-B Olive Sternenberg Lumber Co., wildcat 7,100 ft. north of production in the Olive field, Hardin County, drilled to a depth of 12,946 ft. Deep tests were made through perforations at 12,838-56 ft. and open hole between 12,858-12,946 ft.; however, operators were never able to get the well to flow due to heavy mud in the hole. Operators are now plugging back for tests in upper sands between 12,700 and 12,800 ft. The 5-in. liner is cemented in the hole to 12,858 ft.

In Jackson County, 1 mile southeast of Stewart field and 1 mile southwest of Ganado field, Blanco Oil Co. and Al Buchanan 1 John Lind, wildcat, recovered 720 ft. of oil and 1,600 ft. of salt water and 30 ft. of sand on a 41-minute drill-stem

test through perforations at 7,058-60 ft., using a 2,500-ft. water cushion and ¼-in. chokes. Test commenced flowing in 15 minutes. Operators have squeezed these perforations and are preparing to reperforate for a new test in the same sand. Previous test at 7,032-40 ft. also had recovered gas. Total depth is 7,400 ft., with 5½-in. casing set at 7,370 ft.

There were 14 new locations reported this week, 5 being wildcats, 1 each in Fayette, Jackson, Liberty, Orange, and Tyler counties. Brazoria, Hardin and Wharton counties each received two new starts. Three oil wells and seven dry holes were completed this week with three of the dry holes being wildcats, one each in Fort Bend, Hardin and Wharton counties. South Mayes field in Chambers County, Katy field, Harris County, and Lolita field, Jackson County, each received one producer.

UPPER GULF COAST TEXAS WILDCAT FAILURES

Fort Bend County: O. J. Marten 1 J. R. Farmer, R. R. Hunter Sur., 2 mi. S of Clodine production, dry, TD 7,703 ft.

Hardin County: Humble 1 Nora J. Liter, Wm. M. Young Sur., 2½ mi. NW of Sour Lake, dry, TD 9,090 ft.

Wharton County: D. M. Wallace 1 J. W. Kubela, H&TC Sur., 3 mi. W of Pierce, dry, TD 6,000 ft.

LA.-ARK.

Columbia County Discovery Well Nearing Completion

SHREVEPORT.—McAlester Fuel Co.'s second successful wildcat test in Columbia County, the 1-A Alexander in NE SE 17-17s-19w, was nearing completion last week. Production was 44 bbl. of oil a day from the Travis Peak at 4,333-38 ft. Location is 1 mile west of the Village field and east of the Magnolia area.

In Lafayette County, S. G. Myers 1 T. C. Short, 34-15s-24w, was drilling below 3,998 ft., with the following sample tops announced: Annona 2,060 ft., Tokio 2,452 ft., Paluxy 2,795 ft., Massive anhydrite 3,812-3,975 ft. A broken sand with shows of oil and salt water was found at 2,778-94 ft.

Louisiana exploration tests were active but no decisive depths reported. In Catahoula Parish, Penrod Drilling Co. 1 J. P. Mitchell, 36-8n-7e, had total depth at 9,471 ft. in the lower Cretaceous. It was swabbed down to 8,400 ft. with no shows; reperforated at 9,326-30 ft., filled up and swabbed down to 3,500 ft., recovering mostly wash water with a trace of oil.

In Jackson Parish, Shell Oil Co., Inc. 3 Tremont Lumber Co., deep test in the Chatham gas field, had total depth at 12,317 ft. in hard rock. Perforations at 9,820-44 ft. gaged 2,125,000 cu. ft. of gas daily on 1½-in. tubing choke with a tubing pressure of 425 lb. Plug was set at 9,800 ft. and perforations were to be made at 9,208-24 ft.

NORTH LOUISIANA SUCCESSFUL WILDCAT

Franklin Parish: Atlas Oil & Refining Co. 1 Ayer Tbr. Co., NE NW SW NW 26-14n-9e, flowed 4,150,000 cu. ft. of gas per day from Tuscaloosa at 6,572-86 ft., Killens Ferry discovery well, Cook Mountain 1,112 ft., Sparta 1,257 ft., Wilcox 2,442 ft., Midway 4,410 ft., chalk 4,903 ft., Gas Rock 4,922 ft., Ozan 5,062 ft., Basal Austin 5,622 ft., Paluxy 6,710 ft., TD 7,037 ft.

ARKANSAS WILDCAT FAILURE

Little River County: K. E. Merren 1 Lewis, NW NW SW 1-13s-31w, dry, TD 3,004 ft., Base Annona 472 ft., Base Ozan 600 ft., Buckrange 1,093 ft., Tokio lime 1,303 ft., Paluxy 1,530 ft., anhydrite 2,345 ft., Massive anhydrite 2,422 ft., Basal Massive anhydrite 2,507 ft., Kilpatrick 2,507-28 ft., Travis Peak 2,957 ft.

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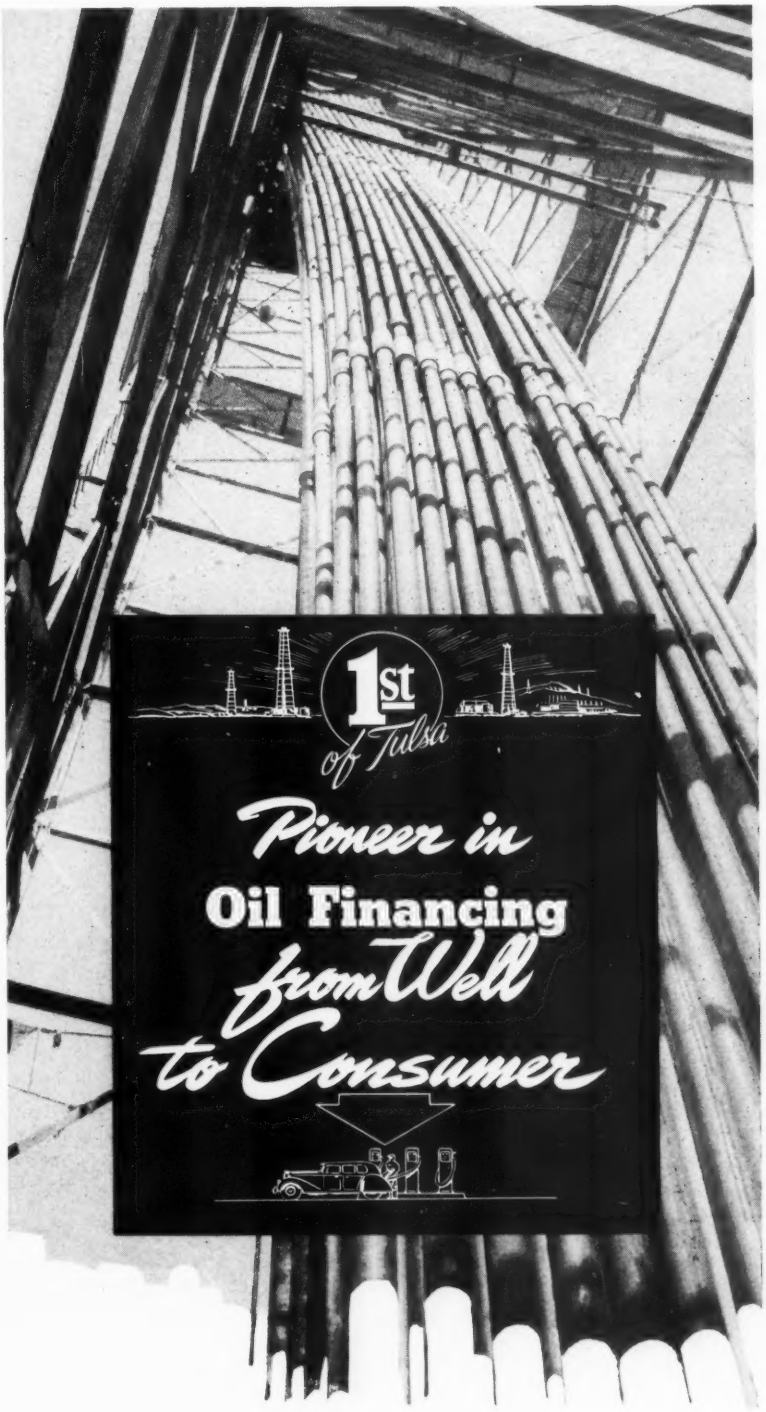

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PERMIAN BASIN

Coke County Discovery Flowing Clean Oil

MIDLAND. — Sun Oil Co.'s northwest Coke County discovery, the 1 Jameson, 23 miles northwest of Robert Lee, was still flowing from 5 to 6 bbl. of clean, 45°-gravity oil an hour late last week. It had cleaned itself through ¼ and ⅜-in. chokes then was placed on ¼-in. chokes, top and bottom. In 6 hours it produced 31.32 bbl. of oil and a small amount of wash water, there being no water with the oil. Tubing pressure was 175 lb. and casing pressure was 800 lb. On last report, gas-oil ratio had not been determined but was estimated at 750 to 1. The well is flowing naturally and will probably not be acidized until storage is erected. Considerable interest has been shown in the test and Sun will undoubtedly stake out offset locations.

By the middle of last week the test had been swabbed down to around 2,000 ft. from the surface, at which time it began to head out water, mud and oil. The swab was pulled twice at hourly intervals and at that time it started flowing a steady stream of fluid, mostly oil and drilling water. When chokes were installed and the well shut in overnight, casing pressure built up to 825 lb. and tubing pressure was 800 lb.

The drill-stem test last week was in the crinoidal zone of the Strawn, at 6,206-30 ft. The only other production from this zone in the West Texas Basin is the Todd Deep field of northern Crockett County.

In Ector County, Rowan Drilling Co. 2 J. E. Parker, on the southeast end of the TXL field, was rated as one of the field's largest producers from the Silurian. On a 4-hour drill-stem test at 8,419-8,500 ft., it flowed 243 bbl. of 40°-gravity oil. Gas-oil ratio was 837 to 1. Location, in Section 40, T&P Survey, is about 2½ miles south of the nearest test showing oil in the Silurian, and an east offset to Rowan's 1 Parker, which is the most southerly Devonian producer in the field. On last report it was drilling below 8,738 ft.

In southwestern Andrews County, Lion Oil Refining Co. 1 Tennie, outpost test to production from the Devonian in the Dollar Hide field, topped the Devonian at 7,901 ft., from an elevation of 3,144 ft. Although it was said to be 218 ft. low to Pacific Western Oil Co. 1 Cowden, nearest Devonian producer, the well made a 5-hour test with packer set at 7,898 ft.; showing gas at the top in 5 minutes, and oil in 2 hours and 40 minutes. In the next 2½ hours it flowed 46 bbl. of clean oil, with no water.

SOUTHEASTERN NEW MEXICO

HOBBS.—Sun Oil Co. 1-B McKinley, lower Permian test on the north side of the Hobbs field, east central Lea County, swabbed down to around 4,000 ft. from the surface, recovering oil and wash water. After treating with 4,000 gal. of acid in open hole, at 7,543-7,658 ft., it recovered load and residue, then swabbed 8 hours to make 60 bbl. of fluid, of which 75 per cent was oil.

In eastern Chaves County, the first of four tests outside the proven limits of the Caprock field, got under way last week. It is Barney Cockburn 1 State, SE SW 36-12s-31e, and will be carried to around 3,050 ft., it was said. Another test in the area is Great Western Producers, Inc. 3-L State, SW SW 12-13s-31e, which will go to 3,050 ft. if production is not found in the Caprock sand.

In Lea County, Skelly Oil Co. 5-B Baker, southeastern flank well of the Brunson Ellenburger field, near Eunice, in SE SW 10-22s-37e, swabbed 27 bbl. of oil and 12 bbl. of water in 4 hours after treatment of the Drinkard zone at 6,480-6,510 ft. with 2,000 gal. of acid. This test missed the Ellenburger and was into the pre-Cambrian.

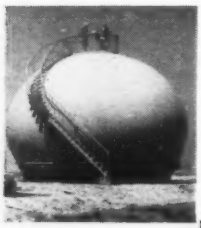
Rowan and Penrose 5 Walden, extension to lower Permian production in the Drinkard field of eastern Lea County, continued testing at 5,173 ft. after swabbing 43 bbl. of oil and 9 bbl. of water. Southeast of Clear Fork production at Drinkard, Skelly Oil Co. 2 Steeler, NE NE 17-23s-37e, was below 9,645 ft. in dolomite. with no shows of oil or gas below 7,200 ft.

MISSISSIPPI

Forrest County Deep Test Swabbing at 12,400 Ft.

JACKSON. — Mississippi's deep wildcats were being watched with considerable interest, with an eye to future trends, according to reports here. In Forrest County, Superior Oil Co. 1 Bradford, 21-3n-13w, was testing and swabbing at approximately 12,400 ft., but no details were forthcoming. In Adams County, Phillips Petroleum Co. 1 Artman, 36-8n-2w, was said to be flowing from 5 to 6 bbl. of oil an hour. It was thought that perforations at 5,618-22 ft. had been squeezed but the new perforation depth was not available.

In Jefferson County, Humble Oil & Refining Co.'s two deep tests were attracting interest. The 2 Gordon, 31-9n-1w, perforated at 3,636-43 ft., and a drill-stem test recovered 30 ft. of heavy oil, 90 ft. of oil and water, and 90 ft. of salt water, with gas coming to the surface in 5 minutes. These holes were squeezed and a drill-stem test made at 3,593 ft., which recovered 1,097,000 cu. ft. of gas and 21.7 bbl. of fluid of about 50 per cent salt water. Operators squeezed and reperforated at



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3,639-41 ft. but had not made tests on last report. Humble's 1-B Gordon, 44-9n-1w, found no shows in side-wall cores at 11,242 ft. Total depth is 11,379 ft. in shale and lime. The same operator's 1 Board of Supervisors, 16-8n-5e, in Lincoln County, had total depth at 10,680 ft. and was coring below that depth.

MISSISSIPPI WILDCAT FAILURES

Issaquena County: C. H. Osmond 1 Anderson-Tully Lumber Co., NE SW 9-17n-3e, dry, TD 7,710 ft., Cook Mountain 1,207 ft., Sparta 1,405 ft., Wilcox 2,950 ft., Midway 5,032 ft., conglomerate 5,524 ft., Gas Rock 5,531-75 ft., Tuscaloosa 6,507 ft., Marine Tuscaloosa 6,878 ft., Massive sand 7,209 ft.

Lamar County: Humble Oil & Refining Co. 1 J. F. Fowler, NW NE 27-2n-14w, dry, TD 10,500 ft., no tops reported.

LeFlore County: L. Jones & Assoc.-S. J. Tucker 1 R. V. Howard Unit, SE NW NE NE 17-19n-2w, dry, TD 4,650 ft., Midway 2,395 ft., Eutaw 3,892 ft., Tuscaloosa 4,597 ft.

EASTERN TEXAS

New Paluxy Field Found in Northwest Smith County

DALLAS.—Opening of what is considered a new Paluxy field, in northwest Smith County, 1 mile east and north of the Mount Sylvan field, Delta Drilling Co. 1 W. H. Boynton, J. J. Smith Survey, recovered 56 bbl. of dark, greenish-black oil of an estimated 33.5°-gravity on drill-stem test at 7,516-29 ft. in the upper Paluxy. Using a 1,470-ft. water cushion and 3/8-in. chokes, there was little flowing pressure but a good blow of gas was made immediately after the tool was opened. Initial bottom-hole pressure was 1,850 lb., which increased to 2,300 lb. at the end of the 40-minute test. Sample tops were reported as: Pecan 3,250 ft., Austin 4,580-4,610 ft., Woodbine 5,210-16 ft., Comanchian 6,110-28 ft., and Goodland 7,355-70 ft. Operators were to drill ahead to the lower Paluxy.

The 1 Boynton was checked 100 ft. low on the Mount Sylvan discovery, having topped the Paluxy sand at 7,511 ft., drillers top, at an elevation of 528 ft., and is separated from the field by a Paluxy failure.

A deep Smackover lime test on the East Texas border was disclosed last week. Stanolind Oil & Gas Co., with Continental Oil Co. holding an interest, will drill the test 9 miles north of Marshall, in the Woodlawn section of Harrison County. The planned depth was said to be 10,200 ft. Location is in the same area where Stanolind and Continental had a dry hole in the Travis Peak at 6,870 ft. last year.

A long-awaited Travis Peak test in the Ponta area of northeastern Cherokee County was reported in the making last week. Brown and Delta Drilling Co., Tyler, Tex., is to make the deep test on the Frances Lester 80 acres in the Russell Survey. Sun Oil Co. has done considerable geophysical work in the area, and other majors will be interested in the test.

EAST TEXAS SUCCESSFUL WILDCAT

Limestone County: J. V. Fleming 1 Mary Ward, P. Varela Sur., elev. 517 ft., pumped 19 bbl. oil in 24 hours, Woodbine 2,970-76 ft., TD 3,027 ft., gravity 36.4°.

EAST TEXAS WILDCAT FAILURES

Cherokee County: W. H. Foster 1 O. K. Ellis, John Stroud Sur., ½ mi. E of Summerfield, elev. 524 ft., dry, TD 4,333 ft., Pecan 3,277 ft., Austin 4,107-4,290 ft., Woodbine 4,310 ft., no shows.

Franklin County: Ben T. Head et al 1 James Litterall, J. W. Keith Sur., NW cor. of county, elev. 404 ft., dry, TD 4,520 ft. in Paluxy, no shows.

Ben T. Head 1 Anderson, J. H. Walters Sur., 5 mi. S of Mt. Vernon, elev. 500 ft., dry, TD 7,265 ft., Pecan 2,181 ft., Austin 3,109-74 ft., Woodbine 3,936 ft., Paluxy 5,481 ft., Massive anhydrite 6,816-6,975 ft., Hill 7,080 ft., no shows.

Hill County: Swarthout, Ohlefest & Lewis 1 J. Holderman, C. Sullivant Sur., in abandoned Mt. Calm field, elev. 656 ft., dry, TD 760 ft., Austin 648 ft., sand with show of oil 704-09 ft.

ROCKY MOUNTAIN

Baggs District Wildcat Has Favorable Shows

DENVER.—Kerr-McGee-Phillips 1 Unit, SE SE 10-12n-92w, Baggs district, Carbon County, Wyoming, which has had a number of shows of oil and gas in both the Wasatch and Fort Union formations, continues to look favorable. It is drilling below 4,160 ft., and a drill-stem test at 3,930-65 ft., open 1 hour, recovered 125 ft. of oil and gas-cut mud. It is believed to be still in the Fort Union. A previous test at 3,796-3,810 ft., open 1 hour, recovered 2,250 ft. of water, the flowing pressure being 450 psi. and the hydrostatic pressure 2,100. A test at 3,771-81 ft. showed 3,474,000 cu. ft. of gas, 50 ft. of oil and no water.

Rangely field.—Allowable for the Rangely field was reduced from 165 to 135 bbl. per well per day, effective December 1. During November it was increased from 150 to 165 bbl. There were 169 Weber sand wells on production on December 1, and 18 wells were scheduled for completion in December. Fifteen wells, mostly on the south side, are being pumped.

Continental Oil Co. 2 Dorothy Rooth, SW SW 15-2n-103w, which was completed last August as a discovery in the Shinarump, and the only producer in the field from that formation, continues to be something of a mystery. It flowed 847 bbl. per day initial production. Several times it has ceased to flow and then come back. On the last occasion it was put on the pump. After pumping several days it began flowing again, making around 400 bbl. per day with 562 bbl. in 24 hours as the best record. It is still flowing and producing its allowable.

Stanolind Oil & Gas Co. released locations this week for two outposts on the southeastern side of the field. Its 1 Pepper, SW SE NW 31-2n-101w, is 2 miles east of the nearest producer. The other is 1 White, SW SE NE 2-1n-102w. The water line has not yet been determined on that side of the field.

Keith Extension in prospect.—Texas Co. 1 Sorrell-Government, C NE NW 29-36n-6e, Keith District, Liberty County, Montana, topped the Ellis at 2,813 ft., and in a drill-stem test at 2,809-49 ft., open 45 minutes, recovered gas at the rate of 1,350,000 cu. ft. It is ½ mile north and a little east of the 1 Cicon, completed early in 1945 as a discovery for 3,000,000 cu. ft. per day through perforations at 2,892-2,910 ft.

New operations.—Only 8 new operations were reported, a low for nearly a year and due to some extent to weather conditions. These included four in Colorado, of which three are in the Rangely field, and the fourth a wildcat in La Plata County. The latter is Hudson-Coryell 1 Schmidt, C NW NE 36-34n-12w, Red Mesa

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District, an old well being deepened from 1,335 ft. and now drilling at 2,300 ft.

Wyoming had two new operations, one in Badger Basin and the other in the Frannie field. The Badger Basin well, which will be a test to the Tensleep, is General Petroleum Corp. 2 Baderia, C NE NW 7-57n-101w. Fred M. Manning, Inc., has the contract and is moving in rotary from Elk Springs, Colorado. Location is ½ mile northwest of Resolute Oil Co. 9 Northern Pacific which is shut down at 8,393 ft. after failing to find production in the Frontier, and is believed to have drilled into a fault. The east offset to No. 9 was completed a few months ago for 1,800 bbl. initial. General Petroleum started a Tensleep test to go to 12,000 ft. in NW SW Section 8 in 1944, but completed as a small producer in the Frontier at 8,492 ft.

Two new operations in Montana are both wildcats. Bannatyne Oil Syndicate has let contract to Meeks & Beardslee for a Devonian test in the old Bannatype field in Teton County in 1 Speer, NW NW SE 5-25n-1e. The other is C. W. Stephens 1 Venetz, NE NE SE 29-27n-3e, in the Pondera field district in Pondera County.

Completions.—Nine wells were completed, of which 8 were oil wells with initial production of 2,658 bbl., and 1 was a dry hole. Seven of the 8 oil wells were in the Rangely field in Colorado with initial production of 2,458 bbl., and the other was Continental Oil Co.'s discovery in Elk Springs, Colorado, estimated at 200 bbl. per day. The dry hole was in the Half Moon field, Park County, Wyoming.

COLORADO SUCCESSFUL WILDCAT

Elk Springs, Moffat County: Continental Oil Co. 1 Margaret V. Smith, SW SE SW 30-5n-98w, TD 6,331 ft., top of Weber sand 6,086 ft., water in lower part, plugged back to 6,140 ft. and shot with 77 qt. at 6,097-6,126 ft., est. 200 bbl. per day, 30 gravity, elev. 6,177 DF.

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SOUTH LOUISIANA

Bayou Des Glaise Dome Gets Deeper Producing Horizon

NEW ORLEANS.—A new and deeper producing horizon for the Bayou Des Glaise dome, Iberville Parish, has been opened by Humble Oil & Refining Co. 2-B E. B. Schwing et al, 86-8s-8e. On potential test it gaged 48 bbl. of 55°-gravity condensate daily through a 10/64-in. choke with 2,041,000 cu. ft. of gas, ratio 43,100 to 1. Flowing pressure is 4,250 lb. Total depth is 11,890 ft., and production is through perforations at 11,716-726 ft. with production packer set at 11,666 ft.

Union Oil Co. of California 4-C Louisiana Furs, has been completed as a deep gas well in the Fresh Water Bayou field of Vermilion Parish. Located in 33-16s-12e, this test was drilled to a total depth of 13,941 ft., where pipe was stuck. Pipe was not recovered and operators shot pipe off and a cement plug set at 11,825 ft., and 7⅝-in. casing was perforated from 11,535-55 ft. where it flowed gas. Well is now shut in waiting on state potential.

Continental Oil Co. 7 Pardee, 1 mile northeast extension to gas and condensate production in the Reddell field of Evangeline Parish, is swabbing for completion. Total depth is 10,040 ft., with 6-in. casing cemented to the bottom. Perforations for an initial test have been made in the Tate sand at 9,955-80 ft.

The Texas Co. has junked its wild blowout well in Atchafalaya Bay in the Belle Isle field area of St. Mary Parish, and has located another deep test in the immediate vicinity. The test, 5 State-Atchafalaya Bay on State Lease 340, Township 18s-10e, was being logged when the well blew out flowing gas and condensate for 2 weeks before being controlled. Total depth is 11,310 ft. and 7-in. casing was cemented at 11,120 ft.

Seven new locations were reported this week with only one wildcat in West Feliciana Parish. Four oil development wells were completed, one each in Cameron, Evangeline, Lafourche, and St. Mary parishes. One dry wildcat was reported in Jefferson Davis Parish.

SOUTH LOUISIANA WILDCAT FAILURE

Jefferson Davis Parish: Stanolind Oil & Gas Co. 1 Alf Reeves, 33-9s-5w, 1 mi. S of production at Welsh Dome, dry, TD 8,358 ft.

APPALACHIAN FIELD

Large Oriskany Gas Well Completed in Jackson Co.

PITTSBURGH.—In Ripley district, Jackson County, West Virginia, United Fuel Gas Co. completed another large Oriskany gas well in 5,782 F. F. Starcher with a final gage of 10,000,000 cu. ft. gas, natural. Surface elevation was 738 ft., Corniferous lime 4,826 ft., Oriskany 4,935 ft., and total depth 4,945 ft. In Washington district, Kentucky Oil & Gas Co. is reported to have a 12-bbl. well from the Salt sand on the A. C. Skeen farm.

In Freemans Creek district, Lewis County, the test of Hope Natural Gas Co. 9,082 Thomas Fahey showed a gage of 1,485,000 cu. ft. gas from the Gantz sand, total depth 2,370 ft.

In Elk district Kanawha County, A. C. Radford is drilling through the Oriskany sand in the test on W. W. Wertz farm, and 22 ft. in that member no gas has been struck. Surface elevation is 602 ft., Corniferous lime 4,828 ft. and Oriskany 4,951 ft.

In Union district, Wood County, Tri State Oil & Gas Co. completed a second test,

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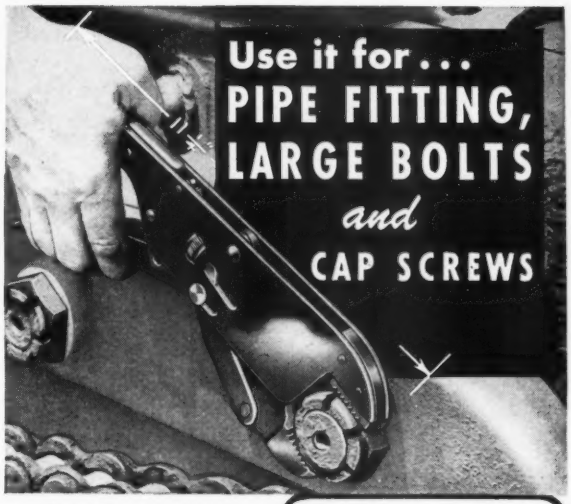

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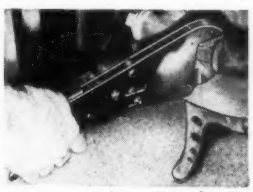

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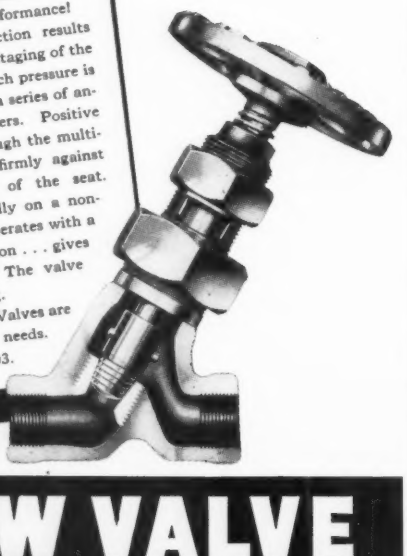

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Cora E. Morris, for 10 bbl. and 400,000 cu. ft. gas from the Berea, total depth 2,140 ft.

New locations totaled 13 and were located in Ripley district, Jackson County; Elk district, Kanawha County; Jefferson and Lurel Hill districts, Lincoln County; Harvey district, Mingo County; Teays Valley district, Putnam County; Murphy district, Ritchie County; Grant district, Wayne County: Reedy district, Wirt County; and Union district, Wood County.

In North Strabane Township, Washington County, southwest Pennsylvania, another good oil well is being completed in the Young pool where the test on Mary W. Neill farm by Charles E. Young filled up and made several flows from the Gordon sand. This operator has made two new locations for a test on the R. D. Fulton and one on the Gulla tract. The latter is northeast of the good well on the Rosa Topka tract.

New locations in southwest Pennsylvania totaled eight, and were located in Boggs and Monor townships, Armstrong County; German and Springhill townships, Fayette County; North Strabane and Nottingham townships, Washington County, and Bell township, Westmoreland County.

CANADIAN FIELDS

Provost Field May Receive Westward Extension

CHATHAM.—A potential extension of the new Provost field 5 miles to the west is sought by Imperial-Provost 7, LSD 7, 1-38-5w4, now nearing completion. The nearest producer to the east, Imperial-Provost 6 has over 13,000,000 cu. ft. of gas.

Pinhorn Dome.—In the Pinhorn Dome area, southern Alberta, McColl-Union 11-A, LSD 11, 35-2-8w4, finished at 2,182 ft., has around 8,000,000 cu. ft. gas from the Bow Island sand. McColl-Union 10-B, LSD 10, 22-4-9w4, is finishing in the Bow Island sand below 2,143 ft.

Elk Point.—In the Alberta central plains area, Elk Point 3, LSD 15, 35-57-5w4, drilled through salt to 5,007 ft., has plugged back to 1,675 ft. to test oil and gas showings in the lower Cretaceous. It is now shut down owing to bad weather conditions.

Deville.—In another area of the central plains, Imperial-Deville 2, LSD 11, 36-51-19w4, recently abandoned at 2,606 ft., encountered considerable gas accompanied by water. The outfit has been moved 6 miles north for Deville 3, LSD 11, 36-52-19w4, for a joint test by Imperial, Anglo-Canadian Oil Co., Home Oil and Calgary & Edmonton Corp.

Medicine Hat.—In the Medicine Hat gas field, southern Alberta, Medicine Hat 72 municipal well, LSD 6, 7-13-4w4, finished at 1,150 ft., had 4,130,000 cu. ft. initial flow. No. 73, LSD 7, 21-13-5w4, at 1,140 ft., had 3,280,000 cu. ft., No. 74 has been spotted in LSD 11, 15-13-6w4.

Whitecourt.—Plans for extensive development in a new Northern Alberta area is indicated by Imperial Oil, which has taken up two reservations totaling nearly 500,000 acres north of Whitecourt and 40 miles west of Edmonton. The first reservation of 366,000 acres near Wabamun Lake covered six townships in Townships 52 to 57, Ranges 7 to 10w4. New holdings are in Townships 55 to 58, Ranges 10 to 12w4, and cover 132,000 acres.

Lloydminster.—Additional new drilling is announced for the Lloydminster field, in eastern Alberta and western Saskatchewan, where a number of wells which recently finished drilling are being put on production. On the Saskatchewan side, Community Services, working east of the proven field, is drilling C.S. 29, LSD 5, 10-50-26w3. with C.S. 30 located in LSD 11, 31-48-27w3. Withers-Lone Rock will follow up completion of No. 1 as a large producer with 4 new wells, 1 in LSD 14, and 3 in LSD 13.

6-47-26w3. Northwest Syndicate D.B. 1, LSD 6, 13-48-28w3, which blew in with heavy gas production, is testing.

On the Alberta side, Husky Refinery 1, LSD 11, 1-50-1w4, bottoming at 2,000 ft. has plugged back and is testing. Commoil - Lloydminster 2, LSD 4, 12-50-1w4, north of the field, is finishing, and will likely be abandoned; but another well will be drilled farther northwest. Lloydbrook Syndicate has location in LSD 1, 2-51-1w4, still farther north, and Zero Syndicate has a far north location in LSD 13, 11-52-2w4.

OHIO, KENTUCKY

Second Well in New Perry County Field Has Good Flow

COLUMBUS.—Preston Oil's second well on the C. W. Shaw, Section 33, Madison Township, Perry County, filled up 1,800 ft. while drilling in and after shot swabbed 40 bbl. and flowed 50 bbl. Clinton sand was found at 3,229-68 ft.

Glenn Harmon 1 A. Shuster, Section 2, Carlisle Township, Lorain County, looks like a small gas pool opener in the northwest part of the Township. Clinton at 2,300-07 ft. gaged 304,000 cu. ft. natural with 1,050 lb. rock pressure.

The west part of the Wheeling pool was extended ½ mile north by the Ohio Fuel 1 H. Y. Miller, Lot 3, Linton Township, Coshocton County. Oriskany sand 3,288-3,304 ft. had a small pay at 3,288 ft. which increased to 1,940,000 cu. ft. at 3,302 ft.

Industrial Gas Corp.'s wildcat on H. H. Bankes, Section 20, Deerfield Township, Morgan County, found the Clinton at 3,997-4,027 ft. with 1,000 ft. oil in the hole. The well is to be shot and tested.

Hanley & Bird missed the Clinton sand on their J. Jordon test, Lot 73, Pittsfield Township, Lorain County, and are drilling on to the St. Peter.

Ohio Fuel's second wildcat test in Jefferson Township, Jackson County, has been staked. Location is on L. Myers, Section 27. Lancaster field reported six locations, Ashland four, Stewart, Brush Creek and Cambridge two each, and Sandyville one. Of the 25 completions, Ashland led with six.

OHIO SUCCESSFUL WILDCAT

Lorain County, Carlisle Township: Glenn Harmon 1 A. Shuster, Sec. 2, Clinton 2,300-07 ft., 304,000 cu. ft., TD 2,330 ft.

OHIO WILDCAT FAILURE

Lorain County, Penfield Township: Ohio Fuel 1 Tressa Pierce, Lot 5, Clinton 2,480 ft., TD 2,573 ft.

EASTERN KENTUCKY

ASHLAND.—Gas well completions in the Eastern Kentucky field reached the highest figures in months during the past week, a check of the field disclosed.

Eight wells were brought in for a total of 4,424,000 cu. ft., and 1 dry hole was noted in operations by the Kentucky-West Virginia Gas Co.

WESTERN KENTUCKY

OWENSBORO.—Western Kentucky operations continued at a slow pace throughout the past week. Only four completions were reported, one a 90-bbl. oil well and the other 3 dry holes. New operations totaled 6 and included 3 each in Henderson and Daviess counties. Active exploratory tests under way at this time include the Carter Oil Co. 1 Handy Blackwell, NW SE SW 7-O-23, drilling at 2,310 ft., and the Carter Oil Co. 1 H. Barrett, 22-P-23, drilling at 635 ft. after setting the 10-in. pipe at 154 ft. Both of the tests are located in Henderson County.

INDIANA

EVANSVILLE. — The Homer Detrick 1 Baker, NW SE NE 8-7s-14w, Posey County wildcat, was officially completed last week to open a new oil area. Located about 1½ miles north of the New Haven pool and about the same distance west of the Prairie pool, the 1 Baker pumped 65 bbl. daily from the Pennsylvanian sand at 1,015-40 ft., total depth 1,044 ft.

At last reports the Henry Smith et al 1 Owen Beloat, NW NW 8-2s-10w, prospective Cypress sand discovery near the town of Princeton, was pump testing the Cypress sand at 1,827-30 ft., total depth. Prior to installation of the pumping equipment, the well swabbed 70 bbl. of fluid, of which 20 per cent was water, in 3 hours.

The prospective westward extension well of the Welborn pool of Vanderburgh County, Basin Drilling Co. 1 L. F. Winkler, NW SE SW 31-6s-11w, is waiting on cable tools to test good oil saturation found in the McClosky at 2,516-22 ft., total depth 2,528 ft. A 1-hour drill-stem test resulted in the recovery of 1,635 ft. of gas, 100 ft. of oil and 95 ft. of oil-cut mud.

Indiana completions showed another slight gain during the past week with five oil wells and four dry holes reported. One wildcat discovery and two dry wildcats were included in the list. New operations announced during the week totaled 10, and were located 2 in Gibson County, 5 in Knox, and 3 in Posey.

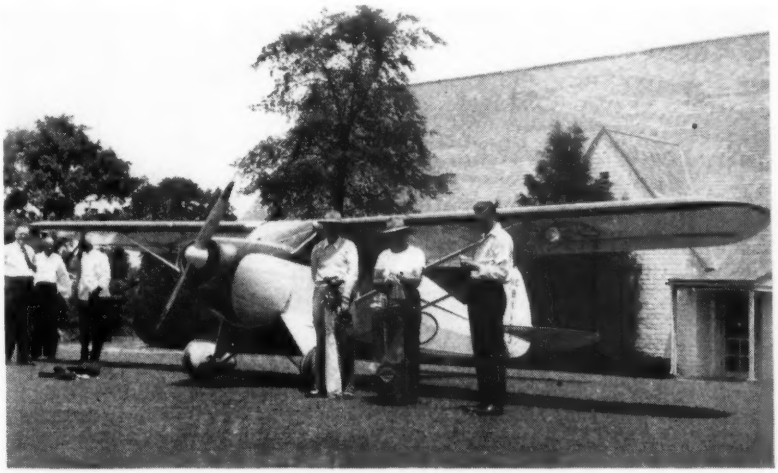
INDIANA SUCCESSFUL WILDCAT

Posey County: Homer Detrick 1 Baker, NW SE NE 8-7s-14w, elev. 368 ft., pumped 65 bbl. oil, Pennsylvanian sand 1,015-40 ft., TD 1,044 ft.

INDIANA WILDCAT FAILURES

Pike County: E. L. Shoudy 1 Otis Thomas, NW NE SE 8-1n-7w, dry at 1,620 ft. in Salem.

W. O. Eckstein 1 Young & Bailey, NE NW NE 2-3s-8w, elev. 431 ft., dry at 1,496 ft., Glen Dean 1,021 ft., Barlow 1,221 ft., Ste. Genevieve 1,432 ft.



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CALIFORNIA

Fishing Job Delays Progress At World's Deepest Well

LOS ANGELES.—A fishing job on the world's deepest drilling well at 16,668 ft. turned attention momentarily to other exploratory efforts in the Pacific Coast.

Pacific Western Oil Corp. 1 National Royalties, Kern County, 5-26s-22e, the world's deepest drilling well, was temporarily halted at 16,668 ft. because of stuck drill pipe. Operators had succeeded in maintaining circulation but at the time of writing pipe was still stuck and could not be freed. Plans were to resume drilling when mechanical difficulties are overcome.

Standard Oil Co. of California started operations on its Wester Washington wildcat in the vicinity of Martha Lake, about 8 miles northeast of Edmonds. The well is Standard of California 1 Alderwood in 35-28s-4e. A series of seismograph surveys preceded selection of the drill site. Standard of California has drilled two other wells in Washington, starting in 1920 when a dry hole was drilled near Aberdeen. The second failure was drilled in Whetoz County early this year.

Two wells are nearing completion stage in the Alondra Park area which was opened to production last August. British-American Oil Producing Co. 1 Alondra, 22-3s-14w, Los Angeles County, is coring in oil-bearing conglomerate at 9,239 ft., which correlates with the producing zone in the discovery well. The Texas Co. et al 9-1 Gardena community, 26-3s-14w, Los Angeles County, is spot coring at 9,469 ft. The Texas Co. et al project is practically an offset to the discovery Bodger well. The British-American Oil Producing Co. 1 Alondra is a whipstock job located approximately 1 mile from the discovery well.

The Del Valle area received a fifth wildcat start, being Shell Oil Co., Inc., project in Sections 20 and 21-5s-17e. Location has not yet been selected but the company has acquired approximately 1,000 acres in the area and a drilling program is definitely planned.

The largest producing well completed in several months was chalked up by Standard Oil Co. of California. A production rate of 1,970 bbl. per day was credited to Standard of California 23-3-P in the Kettleman Hills North Dome area. The company is rigging up another well in the same area and two others are drilling. Standard of California 70-33-V, wildcat in the Middle Dome area of Kettleman Hills, is coring at 12,200 ft.

New operations in California were practically constant. There were 36 new locations authorized this week compared with 33 in the preceding week. All locations were evenly distributed with the exception of Cymric, Kettleman Hills and Jacalitos which received two each.

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KANSAS

Continental Opens New Pool in Barber County

CONTINENTAL OIL CO. brought in a new oil field in Barber County early this week with the completion of a wildcat well, 1 G. R. Smith, NW NW NW 21-33-12w. The well, located about 12 miles southwest of Medicine Lodge and about 2½ miles east of production in the Medicine Lodge oil and gas field, flowed at an estimated rate of 50 bbl. of 27°-gravity oil per hour, with gas at the rate of 1,000,000 cu. ft. per day. This is one of the largest discovery wells completed in Kansas in recent months, and is significant in that it is many miles from any large oil field.

Continental, in partnership with the Kennecott Copper Corp., holds a block of 2,758 acres in this new field.

A new field for Harvey County was also indicated during the past week at the Stanolind Oil & Gas Co. 1 Brandenberger, SE NE NW 12-24-3w. This well, located about 2 miles north of the Potwin field in central Kansas, recovered 600 ft. of oil and 700 ft. of salt water during a test of the Viola lime at 3,872-90 ft. An electric log revealed the top of the Lansing-Kansas City lime at 2,538 ft., the Kinderhook shale at 3,666 ft., and the Hunton lime at 3,788 ft. Operators are now drilling ahead to determine the possibilities of lower pay zones.

Among new potentials listed by the state conservation division last week was a maximum oiler in the new Barry Southeast pool of Rooks County, an Arbuckle pool. The new well is the H. H. & B. Drilling Co. 1 Cabbage, SW SW 7-9-18w, which was given a potential of 3,000 bbl. daily on the basis of an echometer test of production from the Arbuckle at a total depth of 3,505 ft. It is a northeast offset to the pool discovery well, the same company's 1 Hilgers, which made 2,735 bbl. a day according to a depthograph test made in October.

KANSAS SUCCESSFUL WILDCATS

Ellis County: Texas 1 Dreiling, SW SW SW 15-13s-17w, pumped 559 bbl. of 32°-gravity oil from Arbuckle at 3,560-83 ft., anhydrite 1,235 ft., Topeka 2,900 ft., Heebner 3,270 ft., Lansing-Kansas City 3,332 ft., TD 3,583 ft.

Stafford County: Virginia Drilling et al 2 Roberts, C W/2 SW SW 14-21s-12w, pumped 70 bbl. of 37°-gravity oil from Arbuckle at 3,547-602 ft., Topeka 2,772

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ft., Lansing-Kansas City 3,229 ft., cherty conglomerate 3,477 ft., Simpson shale 3,508 ft., Simpson sand 3,543 ft., TD 3,602 ft.

KANSAS WILDCAT FAILURES

Marion County: S. & S. Oil Co. et al 1 Mary Ptacek, SW SW SW 20-19s-4e, dry, TD 2,650 ft., Mississippi lime 2,315 ft., Viola 2,615 ft.

Rush County: H. H. & B. Drilling et al 1 Werth, SW SW SW 6-16s-18w, dry, TD 3,640 ft., anhydrite 1,194 ft., Heebner 3,274 ft., Toronto 3,293 ft., Base Oread 3,305 ft., Lansing-Kansas City 3,314 ft., cherty conglomerate 3,591 ft., Layton sand 3,629 ft.

Alkay Oil Co. 1 Greenwalt, NE SW SW 17-19s-16w, dry, TD 3,845 ft., anhydrite 1,166 ft., Lansing-Kansas City 3,480 ft., Arbuckle 3,825 ft.

OKLAHOMA

New Field Discovered on Garvin-McClain Trend

MAX PRAY and R. L. Bauman have apparently opened a new deep pool of major importance to development along the Garvin-McClain County trend in Central Oklahoma. At the close of the week their 1 Martin-Rose, NE NE 1-4n-4w, 2 miles northeast of the Lindsay townsite in Garvin County, came in flowing an average of 100 bbl. of fluid an hour through casing, with tubing in the hole. Flow was from open hole in the Bromide sand zone at 9,918-10,250 ft., and the oil, which was cut slightly with mud and wash water, was of approximately 42° gravity.

The well was drilled to a depth of 10,180 ft. and casing set at 9,918 ft. When plug was drilled, operators carried the hole on to 10,318 ft. where salt water was encountered. Hole was then plugged back to 10,250 ft., drilling fluid replaced with 40 bbl. of load oil, and tubing run. The well slopped through the casing but stubbornly refused to flow through the tubing. After the crew had worked nearly 12 hours, the well kicked off through the casing and flowed 195 bbl. of fluid the first hour, including the load oil, and then settled to around 100 bbl. hourly during the next 3 hours. Estimates of mud and salt water were 5 to 10 per cent. The well is now shut in for connections and additional tankage.

A prospective discovery by Carter Oil Co. has revived interest somewhat in the area west of the Antioch pool of Garvin County. The wildcat, the 1 Hart, SE SE SE 23-3n-3e, is a deepening job on an old exploratory test abandoned last July. A core from 7,218-24 ft. recovered 5 ft. consisting of 3 ft. of coarse sand showing odor and stain, 1 ft. of sandy lime with spotted stain, and 1 ft. of shale with stain. A drill-stem test was then made and resulted in the recovery of 4,000,000 cu. ft. of gas and 20 bbl. of yellow distillate. The test was not completed.

A shallow gas field has been opened near Oologah, in Rogers County, at the R. H. Lent No. 1, SE SE SW 21-23n-15e. This well showed for about 1,500,000 cu. ft. of gas in sandy lime at approximately 705 ft. and has been shut in.

OKLAHOMA SUCCESSFUL WILDCATS

Garvin County: Standard of Kansas 1 Eskridge, NE SW SW 18-4n-2w, flowed 501 bbl. of 44°-gravity oil per day from 1st Bromide sand at 7,362-72 ft., extension to SW Mayesville, Avant 5,460 ft., Deese 8,140 ft., Bromide dense 7,130 ft., sand 7,290 ft., TD 7,376 ft.

Hughes County: B. C. Deardorf 1-A Miller, SE SE SE 5-7n-9e, pumped 125 bbl. of 28°-gravity oil per day from Calvin sand at 885-906 ft., twin to Brock sand discovery, TD 913 ft.

McClain County: Big Chief Drilling Co. 1 White, NE SE SE 33-5n-2w, dual completion flowed 288 bbl. of 42.5°-gravity oil from Pennsylvanian sand at 6,621-42 ft. through $\frac{7}{8}$-in. casing choke, and 408 bbl. of 43.7°-gravity oil from Hunton at 6,667-90 ft. through $\frac{3}{4}$-in. tubing choke, Belle City 4,300 ft., Hogshooter 4,700 ft., Checkerboard 5,620 ft., TD 6,752 ft.

OKLAHOMA WILDCAT FAILURES

Cotton County: S. D. Johnson 1 Helton, SW SW SW NE 5-4s-12w, dry, TD 2,670 ft., sand 1,670-79 ft., broken lime 1,690-715 ft., sand 1,864-84 ft., lime 1,884-2,006 ft., sand 2,089-110 ft.

J. G. Beard 1 Geimansaddle, NW NW SW NE 24-4s-12w, dry, TD 2,503 ft., sand 2,106-28 ft., lime 2,249-75 ft., sand 2,494-503 ft.

D. H. Bolin 1 Clampitt, C W/2 NW NW NW 24-5s-12w, dry, TD 2,305 ft., sand 1,474-82 ft., lime 1,509-13 ft., sand 2,004-10 ft., red shale 2,063-81 ft., sand and shale 2,291-301 ft.

Hastings & Knight 1 J. L. Taylor, NE NE NE SW 34-3s-11w, dry, TD 1,515 ft., sand 1,490-95 ft. with a stain and odor of oil.

McMahon & Kelleber 1 Ko-Ass-Echon-Ochol, SE SE NE 12-3s-12w, dry, TD 2,002 ft., sand 1,859-65 ft., Megargle lime 1,873 ft.

Standard of Kansas 1 Adams, SE SE NE SE 28-3s-12w, dry, TD 2,257 ft., Arkadelphia sand 1,666-79 ft., hard lime 1,772-83 ft., sand 1,880-919 ft., broken sand 1,930-47 ft.

Griffin & Barbre 1 Scruggs, NW NW NW SE 30-3s-12w, dry, TD 2,005 ft., broken sand and shale 1,078-96 ft., sandy lime and shale 1,408-42 ft., sand 1,855-58 ft. and 1,962-70 ft.

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20-2s-11w, dry, TD 2,211 ft., sand 1,110 ft. with a slight stain of oil, shale and shale streaks 1,550-650 ft., lime 1,960-72 ft., sand 2,090-95 ft.

Cochran & Cain 1 Thrasher, NE NE SE NE 26-4s-10w, dry, TD 1,650 ft., sand and shale 1,465-85 ft., lime 1,485-89 ft., sand and shale 1,489-93 ft., sand 1,610-14 ft.

L. H. Choate 1 Cain, NW NW NW NE 25-3s-10w, dry, TD 2,208 ft., sand 1,280-94 ft., 1,450-47 ft., 1,659-72 ft. and 1,966-74 ft.

J. F. Richardson 1 Parks, NW NW SE 26-2s-10w, dry, TD 2,208 ft., sand 1,373-80 ft., 1,489-99 ft., 1,967-78 ft.

Burk-Divide Oil 1 Rodgers-Watkins, SW SW SW SW 29-2s-10w, dry, TD 2,510 ft., sand 1,206 ft., 1,439-66 ft. and 1,701-14 ft.

Panhandle Refining 1 Kennedy, SW NE NW 21-1s-10w, dry, TD 2,500 ft., sand 2,429-34 ft. with a show of oil.

Noble County: Morgan 1 L. H. Wentz, NE NE SW 12-22n-1e, dry, TD 4,827 ft., Layton 3,320 ft., Oswego 3,900 ft., Red Fork 4,198 ft., Mississippi lime 4,460 ft., Misener 4,725 ft., dolomite 4,772 ft., Wilcox 4,806 ft.

Pontotoc County: Oil Gas Industries, Inc. 1 Jenkins, NE NE SE 20-4n-4e, dry, TD 2,170 ft., sand 1,025-30 ft., dolomite 1,616 ft., Viola 1,676 ft., Bromide 1,872 ft., 1st sand 2,000-20 ft., 2nd sand 2,060-150 ft.

Allied Oil 1 Forrester, NE NE SW 33-3n-8e, dry, TD 4,044 ft., Cromwell 1,905 ft., Woodford 2,810 ft., Viola 3,264 ft., Bromide dense 3,372 ft., McLish lime 3,670 ft., sand 2,954-4,032 ft.

Stephens County: F. L. Chapman and B. B. Burke 1 W. H. Bull, SE SE NE NE 34-2s-9w, dry, TD 2,515 ft., sand 2,490-500 ft.

Nu-Enamel 1 L. M. Henderson, NE NE SW 11-1n-4w, dry, TD 5,520 ft.

Tillman County: L. W. Winkler & Son 1 Stone, NE NE NE 4-3s-17w, dry, TD 2,961 ft., Canyon lime 2,915 ft.

ILLINOIS

Dale-Hoodville Deep Test Drilling In Devonian

MATTOON.—Shell Oil Co.'s deep test in the Dale-Hoodville pool has reached the Devonian lime, and the only oil show encountered to date was a slight show in the St. Louis at 3,580-86 ft. An electric log was run to a depth of 5,398 ft. which indicated the top of the Kinderhook at 4,885 ft., the Louisiana at 4,930 ft., Chattanooga at 4,938 ft. and the Devonian at 5,100 ft. The well, first deep test in the field, is now drilling ahead below 5,493 ft.

Two new oil pools, eight extensions to pools, and two new pay sands in pools were discovered in Illinois in November according to the monthly drilling report issued by the State Geological Survey. New pools were Lancaster Central in Wabash County producing from the Rosiclare lime and Boos East in Jasper County producing from the Rosiclare and McClosky limes. Extensions were to Boos North in Jasper County, Marine in Madison County, Maud North and Browns in Wabash County, Ingraham West in Clay County, Clay City and Goldengate in Wayne County and Trumbull in White County. New pays were the Rosiclare lime in the Trumbull pool and the Levias lime in the Browns pool. A wildcat well east of Panama in Bond County, which was completed for an initial production of 5,000,000 cu. ft. of gas in the Pennsylvanian at a total depth of 753 ft. may open a new gas pool.

A total of 214 wells were completed in Illinois in November, including 110 oil wells and 1 gas well, as compared with 206 completions in October, of which 108 were producing wells. During November drilling activity was distributed throughout the basin with the Clay City pool most active. The Allendale and Lawrence pools have been showing a steady increase in drilling. In the Lancaster Central pool, which was discovered in November, 3 wells were completed in the Rosiclare for initial productions of 820 and 900 bbl. flowing and 924 bbl. pumping.

Completions in Illinois during the past week continued to show a slight decrease with only 37 reported. Of these 16 were oil wells and 1 was a gas discovery in Bond County. Six of the 20 dry holes reported were wildcat failures. New operations continued at a high level with 44 new starts announced. These included 13 wildcats which were distributed throughout the basin area.

ILLINOIS SUCCESSFUL WILDCAT

Bond County: Bond County Gas Co. 2 Harwood, SE NE SW 36-7n-4w, IP 5,000,000. RP 350 psi., sand 749 ft., TD 753 ft.

ILLINOIS WILDCAT FAILURES

Clark County: Clark-Crawford Syndicate 1 Davison, NE NE SW 9-9n-12w, dry at 1,510 ft., Ste. Genevieve 1,407 ft.

Hamilton County: Phillips 1 Thackery, SW SW NE 16-5s-7e, dry at 3,610 ft., Tar Springs 2,671 ft., Glen Dean 2,784 ft., Cypress sand 3,092 ft., Benoist 3,275 ft., Aux Vases 3,393 ft., Ste. Genevieve 2,423 ft., McClosky 3,500 ft., St. Louis 3,600 ft.

Moultrie County: Earl Landon 1 E. Cuffle, NW SE NE 25-13n-6e, dry at 2,149 ft., Tar Springs 1,742 ft., Glen Dean 1,765 ft., Cypress sand 1,950 ft., Aux Vases sand 2,041 ft., Ste. Genevieve 2,085 ft., Rosiclare 2,103 ft., Fredonia 2,134 ft.

Washington County: C. E. Brehm 1 J. Bossen, NW NW SW 6-1s-1w, dry at 1,751 ft., Glen Dean 1,134 ft., Cypress sand 1,355 ft., Aux Vases 1,526 ft., Ste. Genevieve 1,619 ft., Fredonia 1,644 ft.

Wayne County: National Associated 1 O. S. Feather, SW SE NE 1-2s-5e, dry at 3,220 ft., Glen Dean 2,497 ft., Cypress

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Designed with heavy Brass cage to prevent sparks, McGill Vaporproof guards are airtight, water and moisture proof. These guards are grounded as an additional safety feature making them 100% safe for any and all your portable lighting needs. Ask for literature.
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CASE HISTORY 341*

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Before the EXPAN-SEAL Plunger was tried, plungers previously used had a service life varying from 8 to 21 days before recupping was necessary. An EXPAN-SEAL was installed on July 18 and removed for recupping August 27 after 40 days in the well. It was in actual operation 29 days, thus giving a service record 40%, or more, longer than the other types of plungers used.

NO GAS LOCKING—LESS RECUPPING—MORE WEAR (wear varying from 2 to 6 times longer depending on pumping conditions).

Check these outstanding advantages of the G-B EXPAN-SEAL Plunger for insert pumps having either traveling plunger or traveling tube, or for common working barrels.

Check the new principle of operation! EXPAN-SEAL cups bear on the wall *only on the lifting stroke.* They contract on the return strokes to save wear and allow gas and sand to escape. Even when considerably worn EXPAN-SEAL Cups expand to the tube wall, —giving full efficiency for the life of the cups.

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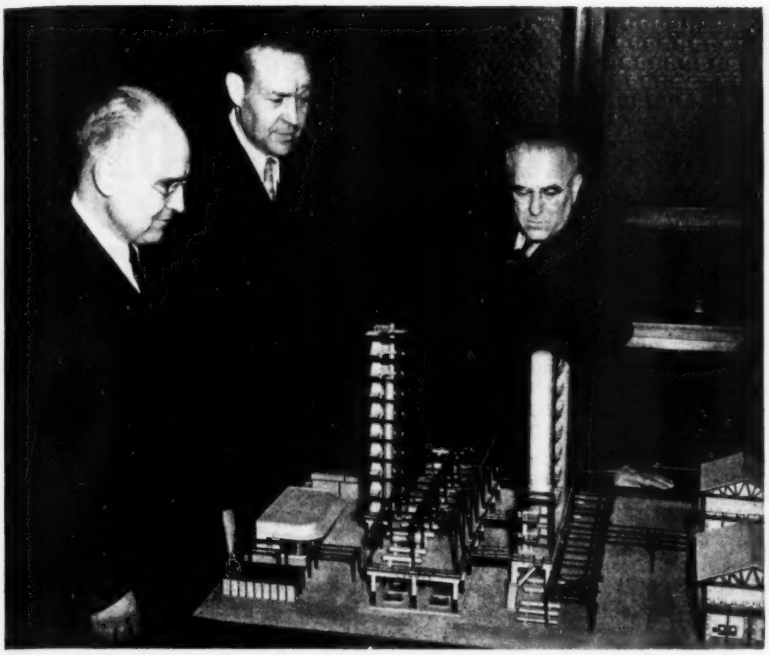

Work is commencing on Shell Oil Co., Inc.'s new lubricating-oil plant in Houston. Cost of the project, which will be adjacent to the company's present refinery on the Houston ship channel, is approximately $10,000,000. The new facilities will consist of five separate units to process high, medium, and low-viscosity-indexed lubricating oils. Here O. M. Morlit, of M. W. Kellogg Co.; W. W. Kraft, of the Lummus Co., and P. E. Foster, manager of Shell's Houston refinery, examine a model of a vacuum-distillation unit similar to one which will be installed in the new plant

sand 2,806 ft., Aux Vases 3,008 ft., Ste. Genevieve 3,099 ft., Fredonia 3,150 ft.

Ed Robinson 1 G. P. Ploesser, SE SE NW 27-2s-5e, dry at 3,330 ft., Glen Dean 2,572 ft., Cypress sand 2,883 ft., Aux Vases sand 3,101 ft., Fredonia 3,222 ft., McClosky 3,224 ft.

FPC Continues Hearing On New-Line Proposals

KANSAS CITY. — The Federal Power Commission hearing on applications of three firms to construct new natural-gas pipe lines from the Hugoton field continued this week following the filing of a motion by Cities Service Gas Co. asking the FPC to dismiss the application of Mid-Continent Gas Transmission Co.

After conclusion of testimony by Mid-Continent, which is seeking to build a line to St. Paul and Minneapolis via Kansas City, Cities Service attorneys filed the motion charging the firm had not established "competent or substantial evidence."

Tyler Plant Taking Shape

TYLER, Tex. — Construction of a 500,000,000 cu. ft. cycling plant by Lone Star Producing Co. 10 miles northeast of Tyler this week was reported well past the half-way point. Early work was delayed by a shortage of materials and labor difficulties.

CALENDAR

December

Mid-Continent Oil and Gas Association, annual ad valorem tax forum, Plaza Hotel, San Antonio, Tex., December 16-18.

American Institute of Mining and Metallurgical Engineers, technical meeting sponsored by the five Texas sections, University of Texas, Austin, December 18-19.

Texas Railroad Commission, hearing on operations of carbon-black plants, Austin, December 19.

Texas Railroad Commission, state proration hearing, Austin, December 20.

1947

January

Society of Automotive Engineers, annual meeting and engineering display, Book-Cadillac Hotel, Detroit, January 6-10.

March

American Institute of Mining and Metallurgical Engineers, annual meeting, and World Conference on Mineral Resources. Waldorf Astoria Hotel, week of March 17

Western Metal Congress and Exposition. Oakland, Calif., March 22-27, 1947.

Western Petroleum Refiners Association, annual membership meeting, San Antonio, March 24-26.

Oil Heat Institute of America, annual convention, Traymore Hotel, Atlantic City, N. J., March 24-30.

April

National Association of Corrosion Engineers, annual convention, Palmer House, Chicago, April 7-10, 1947.

Indiana Independent Petroleum Association, spring convention, Springs Hotel, French Lick, April 9-10.

Southern Gas Association, Biloxi, Miss., April 16-18.

Division of Production, American Petroleum Institute, Eastern District spring meeting, Pittsburgh, April 16-18.

Natural Gas Department, American Gas Association, spring meeting, Stevens Hotel, Chicago, April 30-May 2.

May

Division of Production, American Petroleum Institute, Mid-Continent District spring meeting, Amarillo, Tex., May 22-23.

Division of Production, American Petroleum Institute, Pacific Coast District spring meeting, Los Angeles, May 15-16.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Wind River Indian Agency, Fort Washakie, Wyoming, November 20, 1946. Notice is hereby given that SEALED BIDS will be received until 2:15 P.M. December 20, 1946, at the Wind River Agency, Fort Washakie, Wyoming, for the leasing of the following parcels of Tribal lands, located in Fremont County, Wyoming, for oil and gas mining purposes. TOWNSHIP 6 NORTH, RANGE 2 WEST, W.R.M. UNIT No. 1, Lots 1 and 2, S½NE¼ and SE¼ of Section 6, Containing 316.19 acres. UNIT No. 2, NE¼ of Section 7, Containing 160 acres. TOWNSHIP 6 NORTH, RANGE 3 WEST, W.R.M. UNIT No. 3, NE¼ of Section 12, Containing 160 acres. TOWNSHIP 7 NORTH, RANGE 2 WEST, W.R.M. UNIT No. 4, SE¼ of Section 31, Containing 160 acres. UNIT No. 5, Lots 1 and 2, and E½NW¼, Section 31, Containing 155.32 acres. TOWNSHIP 7 NORTH, RANGE 3 WEST, W.R.M. UNIT No. 6, N½ of Section 36, Containing 320 acres. Separate leases will be drawn on the applicable government form for each of the described six units. Bids may be made on one or more of the described units. The right is reserved to reject any and all bids in the discretion of the Secretary of the Interior. The successful bidder or bidders will be required to pay the cost of advertising, such cost to be prorated if there is more than one successful bidder. The leases will be sold to the highest bidder for a bonus offer upon an acreage basis in addition to the royalty of 12½ per cent. The successful bidder or bidders must enclose with their bids, a certified check or bank draft drawn upon a solvent bank in an amount equivalent to at least 20% of the bonus bid plus 20% of the first year's rental at the rate of $1.25 per acre per annum, as a guaranty of good faith. The checks are to be made payable to the TREASURER OF THE UNITED STATES. The leases must be completed and filed with this Office within 20 days from the date they are received by the successful bidder for execution and accompanied by payment of the remainder of the bonus bid, the balance of the first year's rental and the filing fee of $5.00 for each separate lease. Failure in any of these conditions may subject the bid to cancellation without further notice and forfeiture of payments already made. Leases issued as a result of this sale will contain the usual unit operation stipulation to the effect that within 30 days of demand to subscribe to and operate under such reasonable cooperative unit plan for the development and operation of the area, field or pool embracing the lands included herein as the Secretary of the Interior may determine to be practicable or necessary and advisable which plan to adequately protect the rights of all parties in interest, including the United States. The leases to be issued for the described six units of Tribal land will be made for a term of 10 years and as much longer thereafter as oil and/or gas is produced in paying quantities in accordance with the provisions of the Act of May 11, 1938, (52 Stat. 347) and the regulations approved May 31, 1938, Title 25, Code of Federal Regulations, Part 186. The rate of royalty will be 12½ per cent of the value of all oil, gas, and/or natural gasoline unless the lessor, with the approval of the Secretary of the Interior elects to take royalty in kind. The adequacy of the bonus offers will be determined by the Geological Survey. A suitable bond will be required and such bond must be approved by the Department. The responsibility of complying with any requirements of the Federal Documentary Stamp Statutes will be left with the successful lessees. All bids should be addressed to the Superintendent, Wind River Agency, Fort Washakie, Wyoming, in a plain envelope, marked: BID FOR OIL AND GAS MINING LEASES, CIRCLE RIDGE FIELD, TO BE OPENED 2:15 P.M. DECEMBER 20, 1946. For further information call or write Mr. Waller, Land Division, of the Wind River Agency. J. M. COOPER, Superintendent.

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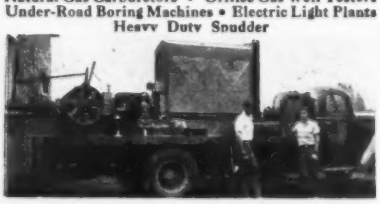

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Among the

Drilling Contractors

Glen Drilling Co. set surface casing last week at Midstates Oil Corp. 1 Genevieve O'Banion, in the S. Holloway Survey, 5 miles southwest of Waskom, Harrison County, East Texas.

Loual Drilling Co. recently has acquired a concentration of approximately 700 acres 2 miles south of Paden, Okfuskee County, Oklahoma. The block consists of leases in the SW of 24, W½ of 25, and N½ and SW of 26-12n-7e.

Murfin Drilling Co. of Wichita, Kans., has staked location for the Darrah, Aurell et al 1 Olsen, NE NE NW 8-20-3e, Marion County. This is a wildcat test 5 miles west of the town of Marion and approximately 6 miles southeast of the Hillsboro pool.

Ideal Drilling Co. of Olney, Ill., has been awarded contract to drill the H. E. Ledbetter 1 Edward C. and George A. Steckler, E½ NE NE 22-1s-12w, Knox County, Indiana. Permit has been granted for the well, which will be a 2,500-ft. test in the East Mt. Carmel pool.

Dan Lester, contractor, was moving in rig for Midstates Oil Corp. 1 Frost Lumber Industries et al, in the E. Pollack Survey, 1 mile southeast of Waskom, Harrison County, East Texas.

Falcon - Seaboard Drilling Co. has staked location for the 1 Tyler, NE NE SW 23-6s-11w, in the highly active Cotton County area of Oklahoma. Location for the well, scheduled to be a 2,000-ft. test, is approximately 1 mile south of the Essaquanahdale field. In addition to this test, the company is starting a new venture southeast of Sparks in Lincoln County. This latter well will be known as the 1 Patterson, NE SE NW 20-13n-5e, and location is about 1 mile northeast of a small discovery completed by Midstates Oil Corp. for 4 bbl. of oil daily from the Prue sand at 3,640-55 ft.

Smith-Horton Drilling Co. will drill Sunray Oil Corp.'s wildcat, the 1 Lockhart & Brown, in Section 22, Public School Lands, southwestern Andrews County, West Texas. The test is planned for 7,000 ft., but in event the Clear Fork zone is dry and it is running high structurally, operators may carry it to the Ellenburger, according to reports. Location is 1 mile east of the nearest Ellenburger producer, in the Martin field, and 2 miles east of Sun Oil Co. 1 N. H. Martin, the Clear Fork limestone discovery in the area.

Fred M. Manning, Inc., has contract and is moving in materials for the General Petroleum Corp. 2 Baderia, NE NW 7-57n-101w, Park County, Wyoming. This venture is a Badger Basin field well, and it will be drilled to the Tensleep horizon.

Union Drilling Co. of Mt. Pleasant, Mich., and Americrude Oil Co. have started operations on a wildcat test located in 16-17n-19w, Osceola County, Michigan. This venture is approximately 8 miles southeast of the Reed City pool, and is scheduled to go to 4,000 ft., or deep enough to test the Reed City pay of the Dundee-Monroe formation. Each company holds a one-half interest in the well.

Calvert & Willis of Olney, Ill., have been contracted by Central Pipe Line Co. to drill the 1 H. W. and R. C. Pote, SW NE SE 18-5s-13w, a 3,050-ft. test in the South New Harmony field of Posey County, Indiana.

Ralph Will, president of **Drilling Contractors, Ltd.,** of Calgary, Alta., has been named to the advisory committee of the Alberta Petroleum Association to succeed R. Robinson, of Shell Oil Co., Inc., who is returning to the United States.

Expansion of operations and the organization of **Kerr-McGee Oil Industries, Inc.,** Midland, Tex., producers and drilling contractors, was announced last week. D. M. Oliver, in charge of the Midland office, has been named general manager of operations for West Texas and New Mexico. Fred F. Kotyza, formerly with Fullerton Oil Co., Roswell, N. M., is the new district geologist. The company has six rotary rigs in operation in the Permian basin and plans have been made for a wildcat campaign in this region to start early in 1947.

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Duncan, Okla. . . . 2225
Tulsa, Okla. . . . 3-6143
Perry, Okla. . . . 758-W
Hobbs, N. M. . . . 275-R

Drilling Contractors Visit Eastern Pipe Mills

A group of drilling contractors and other interested parties visited two large eastern pipe mills November 14-15 to study manufacturing and inspection methods at first hand. The party continued on to the mills from the annual meeting of the A.P.I. in Chicago, the trip having been arranged in advance by Battelle Memorial Institute, Columbus, as a means of acquainting the drilling industry with methods now employed in the manufacture and inspection of drill pipe and casing.

The party visited National Tube Co.'s McKeesport, Pa., plant and the Spang-Chalfant plant, Ambridge, Pa.

After the two plants had been visited, a joint conference was held at Ambridge with representatives of all of the major tube mills in the region and the visiting party participating. Purpose of the conference was to encourage a frank discussion of manufacturing problems, with special emphasis on inspection methods.

J. E. Warren expressed the belief that greater attention to drill-pipe inspection at the mill was warranted, and that such a small additional expenditure might result in elimination of some operating troubles.

R. C. McMaster and H. M. Banta, Battelle Memorial Institute, discussed possible development of improved inspection methods at the mill.

Representatives of the various pipe mills pledged their support of any reasonable inspection method that would give desired results, but stated that methods now used appeared fairly satisfactory to them. Contractors in the visiting party unanimously asked for greater care in the inspection department at the mill.

Present in the visiting party were J. E. Warren, association president; Howard P. Holmes, chairman of the research and educational committee, and a past president of the association; William T. Payne, immediate past president of the association; C. W. Alcorn, member of the research and educational committee; H. W. Ladd, Stanolind Oil & Gas Co., and member of the A.P.I. pipe committee; F. L. Scott, Hughes Tool Co.; John Woodruff, with University of Texas and A.A.O.D.C.,; Brad Mills, executive vice president of the association, and R. C. McMaster and H. M. Banta, Battelle.

Pipe mills represented were Jones & Laughlin Steel Corp., National Tube Co., Spang-Chalfant, Pittsburgh Steel Co. and Youngstown Sheet & Tube Co.

The party also visited Battelle Institute, Columbus, and were impressed with the facilities available for research in almost every field of endeavor. This organization now is retained by A.A.O.D.C.

The Multi-range lightweight BJ Type "T" Tong for Drilling or Production Rigs

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PERSONALS

New Texaco Official Began as Drilling Crew Recruit

A CAREER in the oil industry started as a raw recruit in a drilling crew proved no handicap to A. W. Sands of Los Angeles who became superintendent of drilling and production operations early in October for The Texas Co., Pacific Coast division.

Twenty years ago, Sands, a graduate of Stanford University with a degree in geology, was employed by The Texas Co. After serving a few months on drilling wells, he was appointed resident geologist in the Ventura district. Subsequently, he became assistant to the division superintendent in the Los Angeles basin area, superintendent of production operations in the Ventura district, and assistant superintendent of drilling and production operations for the Pacific Coast division, the department which he now heads.

William S. Hoffmeister, stratigrapher and paleontologist, has been transferred from Shreveport, La., to the Tulsa research laboratory by Carter Oil Co. as research geologist. Other recent Carter transfers include: **Joseph R. Ault,** junior geophysicist, from Dewitt, Ark., to Monroe, La.; **Dan W. Cameron,** division scout, from Oklahoma City to Tulsa; **Richard M. Davis,** seismograph party chief, from Rawlins, Wyo., to Oklahoma City; **Woodson Dawson,** office computer to Greenville, Miss., as party chief; **Carl L. Edmonson,** party chief, from Duchesne, Utah, to Tulsa research laboratory; **Billy D. Low,** from Tulsa laboratory to Duchesne as party chief; and **Harold W. Stoneman,** party chief, from Greenville, Miss., Edmonton, Alta., as field supervisor.

W. B. Pardoe, executive manager of McClanahan Oil Co., has been elected a director of the company.

E. V. Hilliard, head of Hilliard Drilling Co., and **Guy Chapman,** head of Chapman Oil Co., have been elected to the directorate of the Oil and Gas Association of Michigan.

Paul J. Bond assumed his duties as general traffic manager for Pure Oil Co. December 1. He has been associated with the company 26 years. During the war he served 2 years in the supply and transportation division of the Petroleum Administration for War.

D. G. McGinty, district chief gager, has been transferred from Healdton to Tonkawa, Okla., by Shell Pipe Line Corp. Shell promotions included: **R. F. Costen,** pipe liner, to assistant area corrosion engineer, Colorado City, **R. V. Forester,** equipment engineer, to wire chief, Houston; and **H. E. Lynn,** wire chief, to district telephone and telegraph foreman, Houston.

D. L. Sedgwick, Salina, Kans., superintendent of gas operations for Kansas Power & Light Co., has been named chairman of the American Gas Association Midwest Personnel Conference to succeed **C. C. Jolley,** personnel director, Natural Gas Pipe Line Co. of America. **Vernon Myers,** insurance-department manager, Iowa Public Service Co., was elected vice chairman, and **H. H. Duff,** personnel director, Panhandle Eastern Pipe Line Co., reelected secretary.

C. G. Swank, assistant district superintendent at Conroe, Tex., has been transferred to the Thompsons, Tex., district as acting superintendent by Humble Oil & Refining Co.'s production department. Other changes include: **W. W. Thames,** farm boss of Anahuac district, Monroe City, Tex., transferred to Conroe as assistant district superintendent; **A. R. Bruce,** farm boss of Tomball district, Tomball, Tex., promoted to assistant district superintendent; and **A. J. Mangum,** senior gas engineer at the Katy, Tex., gas-cycling plant, promoted to assistant plant superintendent.

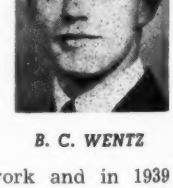
P. C. Thomas, assistant drilling-tool foreman of Consolidada de Petroleos (Sinclair) returned to Venezuela late in November after spending a vacation in the United States.

E. Swain, for about 30 years supervisor of mines for Saskatchewan and in charge of oil and gas operations in the province since the first drilling, is retiring from that position.

George H. Taber, Jr., executive vice president of Sinclair Refining Co., is the new vice president of the American Standards Association. New president of the organization is **Frederick R. Lack,** vice president of Western Electric Co.

E. Gail Carpenter, Wichita geologist and oil operator, last week was elected president of the Kansas Geological Society to succeed Harold Smedley, district geologist for Skelly Oil Co. Other new officers are **Lee H. Cornell,** Stanolind Oil & Gas Co., vice president; **Don W. Payne,** Sinclair-Prairie Oil Co., secretary-treasurer; and **R. A. Carmody,** Gulf Oil Corp., director.

Ted B. Wirth, formerly with M. W. Kellogg Co., has been appointed chief safety engineer for the Middle East operations of Bahrein Petroleum Co., Ltd.



B. C. WENTZ

Brinton C. Wentz has been appointed petroleum engineer for Continental Oil Co. succeeding **Charles B. Allen,** recently named regional production manager in California. Wentz joined Continental in 1938 to do sales-engineering work and in 1939 was transferred to the general offices of the production department. He was made assistant proration engineer March 1.

D. M. Oliver has been named general manager of West Texas and New Mexico operations for Kerr-McGee Oil Industries, Inc. Oliver has been in charge of the company's offices in Midland. **Fred F. Kotyza,** formerly with Fullerton Oil Co. at Roswell, N. M., has been appointed district geologist for Kerr-McGee Oil Industries, Inc., at Midland.

C. Wayne Barbour, Allied Materials Corp., has been elected president and chairman of the Asphalt Institute.

C. W. BARBOUR

B. E. GRAY

Other new executive committee members are **George R. Christie,** Socony-Vacuum Co., Inc.; **Inghram Grayson,** Lion Oil Co.; **Raymond Harsch,** Shell Oil Co., Inc.; **James J. Kelley,** Kerr-McGee Oil Industries, Inc.; **D. N. Myers,** Byerlyte Corp.; and **J. S. Sawyer,** Shell Oil. **Bernard E. Gray** was reelected as general manager-chief engineer, and **Herbert Spencer,** secretary of the institute. **F. V. Widger,** Witco Chemical Co., was named treasurer, and **John N. Smith,** Socony-Vacuum, assistant treasurer.

Henry Pelfery, personnel officer with Carter Oil Co. in Tulsa, has been transferred to the foreign department of Standard Oil Co. (N. J.) and will be sent to Caracas, Venezuela.

R. F. Gray has been appointed office manager of the newly created New Orleans area of Shell Oil Co., Inc. He was transferred from the New York treasury department where he served as chief accountant in charge of the operating accounting section.

C. U. Daniels, who resigned recently as a vice president of Oklahoma Natural Gas Co. to become general manager in charge of operations for Pantepec Oil Co. of Venezuela, will become president of Pantepec April 1, succeeding **Warren Smith,** who plans to retire. **Paul Sticelber** succeeded Daniels as head of Oklahoma Natural's land and geological department and is a new vice president of the concern.

William D. Crampton, president of Standard Francaise des Petroles, S.A., and former director and vice chairman of the Petroleum Administration for War's foreign-petroleum committee, is in the United States on a business trip. Crampton also served as PAW's foreign-division chief, a post which was later taken over by **James Terry Duce,** vice president of Arabian American Oil Co.

P. A. Frye, executive director of natural-gas conservation for Louisiana, has been appointed director of the department of highways by Gov. Jimmie Davis, who said the appointment will become effective December 15. **Paul Montgomery,** state geologist, was named by Davis to succeed Frye.

Joseps L. Seger has been elected vice president, and **J. Dodd Toler,** assistant secretary, of Interstate Oil Pipe Line Co. Seger is general counsel of the company. Toler has been claims, right-of-way, and property-tax agent in the secretary's office.

M. S. Patton, Jr., has been assigned as district engineer of Sunray Oil Corp.'s Big Spring district in West Texas. A 1940 graduate of Colorado School of Mines with a degree in petroleum engineering, Patton served as junior engineer with Shell Oil Co., Inc., before entering the Air Corps in November 1942.

Shifts

John A. Newman, engineer, Shell Oil Co., Inc., Eagle Lake, Tex., to Houston; **Walter C. Chappell,** superintendent, Lupher Drilling Co., Haskell, Tex., to Albany, Tex.; **R. J. Given,** engineer, Phillips Petroleum Co., Beaumont, Tex., to Bartlesville, Okla.; **M. H. Steig,** manager, Phillips Petroleum Co., Houston to Midland, Tex.; **M. K. Main,** engineer, Shell Oil Co., Inc., Kilgore, Tex., to Odessa, Tex.

D. W. Rogers, superintendent, Delta Drilling Co., Tyler, Tex., to Ville Platte, La.; **Paul Johnson,** foreman, Continental Oil Co., Ruston, La., to Bunkie, La.; **E. H. Sheridan,** superintendent, Shell Oil Co., Inc., Lake Charles, La., to Houston; **Paul S. Strain,** engineer, Standard Oil Co. (Ind.), Edwardsville, Ill., to Alton, Ill.; **John V. Brubaker,** foreman, Pure Oil Co., Noble, Ill., to Van, Tex.; **Gus Bealmear,** engineer, Baroid Sales Co., Danville, Ky., to Worland, Wyo.; **John R. Burns,** foreman, Ashland Oil & Refining Co., Henderson, Ky., to McLeansboro, Ill.; **L. H. McFadden,** superintendent, Oil Producers, Inc., Bangor, Mich., to Lacota, Mich; **W. T. Jablow,** engineer, Socony-Vacuum Oil Co., Inc., Woodbury, N. J., to Beaumont, Tex.; **Marvin Yoches,** engineer, Phillips Petroleum Co., Rangely, Colo., to Denver; **James S. Hopkins,** foreman, Amerada Petroleum Corp., Buffalo, Wyo., to Ardmore, Okla.; **G. A. Schofield,** geologist, The Texas Co., Green River, Wyo., to Duchesne, Utah; **Ed Hetland,** superintendent, Fred M. Manning, Inc., Lamont, Wyo., to Rangely, Colo.; **Steve Thomas,** superintendent, Rocky Mountain Drilling Co., Lyman, Wyo., to Bakersfield, Calif.; **Ed Noland,** superintendent, Big Chief Drilling Co., Ardmore, Okla., to Midland, Tex.; **C. R. Allen,** superintendent, Continental Oil Co., Ponca City, Okla., to Pasadena, Calif.; **E. E. Fuller,** foreman, Interstate Oil Pipe Line Co., Wewoka, Okla., to Harlingen, Tex.

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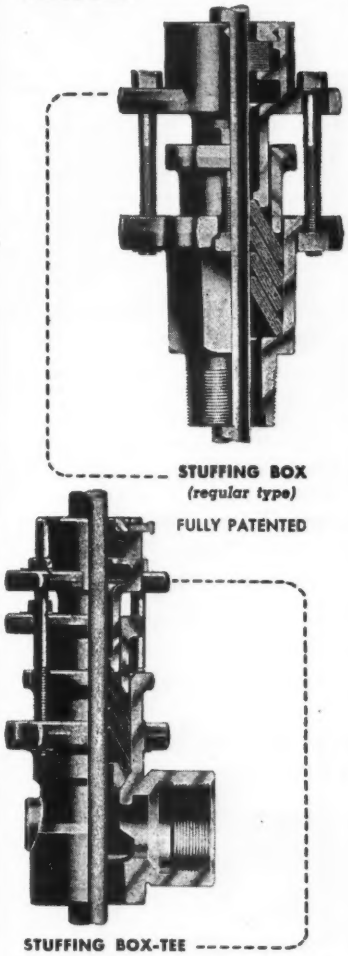

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Equipment Men in the News

Diamond Anniversary Celebrated by Bovaird

W. M. BOVAIRD

At its annual stockholders meeting November 25-26 in Tulsa, Bovaird Supply Co. celebrated founding of the company by David Bovaird 75 years ago at Bradford, Pa. To commemorate the occasion a dinner was held at the Tulsa Club. At the meeting all officers and directors of the company were reelected. Officers are: W. M. Bovaird, president; F. D. Bovaird, vice president; D. M. Bradly, vice president in charge of sales; D. D. Bovaird, treasurer, and R. M. McMahon, secretary. The Bovairds who are now officials of the company are of the third generation and reside in Tulsa. J. H. Bovaird, of the second generation, still has interests in the company and lives in Bradford.

Jacobs New Vice President Of Blackmer Pump

Arthur E. Jacobs has been appointed vice president and sales manager of Blackmer Pump Co., Grand Rapids, according to an announcement by B. L. Gordon, president. Jacobs was formerly general sales manager of the pump division of George D. Roper Corp., Rockford, Ill.

Hammond Iron Works Establishes Texas Plant

Hammond Iron Works, Warren, Pa., will establish a Texas sales division with the fabrication taking place in a surplus war plant in Port Neches, Tex. According to John H. Fitzgerald, division manager, production is expected to begin early in 1947 on a site adjacent to Neches Butane Products Co.

Myers Vice President Of Davey Compressor

Election of J. T. Myers as vice president in charge of sales and production of the Davey Compressor Co., Kent, Ohio, is announced by Paul H. Davey, president. For the past year, Myers has served as assistant general manager of the company.

Catalytic Construction Moves To Larger Headquarters

Consolidation of executive and engineering headquarters in new offices has been announced by T. Ellwood Webster, president of Catalytic Construction Co. The new address will be 1600 Walnut Street, Philadelphia.

Carrier Elevates Three

Promotion of O. W. Bynum as manager of direct sales, John A. Gazelle as manager of distributor-dealer sales, and Carl U. Spriggs as assistant general sales manager has ben announced by Arthur P. Shanklin, vice president and general sales manager of Carrier Corp. They make their headquarters in Syracuse.

Chemical Laboratories Opens Well Logging Service

A well logging service has been announced by Chemical Laboratories, Inc., of Casper, Wyo. H. E. (Ed) Summerford, formerly district geologist for Kerr-McGee Oil Industries, Inc., has become associated with Chemical Laboratories, Inc., to operate this new service.

Goodrich Purchases Tulsa Rubber Products

B. F. Goodrich Co., Akron, has recently purchased Tulsa Rubber Products, Inc., 716 South Boston, Tulsa. It will be operated as a wholly owned subsidiary and retain its name. George R. Bell will manage the subsidiary, which will specialize in industrial rubber products for the oil industry.

Ideco Export Personnel

G. W. Walton supervises export sales for International Derrick & Equipment Co., from headquarters in Dallas. Representatives in New York, Washington, Torrance, Houston, Mexico City, and Caracas, Venezuela, are responsible for individual phases of the export activities. During the past year, Walton has visited the oil fields in Turkey, Russia, France, and England. Just recently he returned from a trip to the Argentine. On the East Coast, Floyd J. Olson, export sales manager, directs sales activities from his office in New York. Pacific Coast equipment and export sales are under the direction of Fred C. Ripley, Jr., who has his office at Torrance, Calif.

G. W. WALTON

FLOYD J. OLSON

Thermoid Makes Owen and Cox Vice Presidents

John Owen and Lester F. Cox were elected vice presidents of Thermoid Co. at a recent meeting of the board of directors.

JOHN OWEN

LESTER F. COX

The announcement was made in Trenton by Fred Schluter, president. Cox, who is factory superintendent of the rubber division, joined the company in 1929. He started with the production department as a scheduler of brake-lining production. In 1937 he was made factory manager, rubber division. Owen, who came to Thermoid in 1942 from Austin-Western Co., began his career with the company as assistant manager, industrial rubber products division. He was made manager of that division in 1943, at which time oil-field products was set up as a separate division, also under his control. In June 1945 he became assistant vice president of these two divisions.

Mapping Concerns Merge

Zingery Map Co., Houston, maker of oil-field maps, has purchased Gulf Coast Engineering Co., Houston, W. W. Zingery, owner, announces. The two companies are being merged under the name of the former. Zingery also announces that Southwest Mapping Co., Fort Worth, of which he is part owner, has obtained the controlling interest in Zingery Oil Map Co., Fort Worth, and that these companies are being merged under Southwest Mapping's name.

Carnes Joins Clayton Mark

Joe R. Carnes, Jr., of Houston, has joined the sales organization of Clayton Mark & Co., manufacturers of petro, hydro, mark, and handle-bar forged-steel unions, to represent the company in the Mid-Continent oil fields. Carnes will make his headquarters at 1752 West Main Street, Houston.

Percy Jones adds Fairbanks-Morse springless printomatic scale and another 10-ton tandem diesel autocar truck to company's Oil-Field Transportation Service, located at 1131 North Eastern in Oklahoma City. New scale is 60 ft. long with a 100,000-lb. capacity